PB81-910214

U.S. DEPARTMENT OF THE INTERIOR

OFFICE OF WATER RESEARCH AND TECHNOLOGY

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 14, NUMBER 14
JULY 15, 1981

W81-02651 -- W81-02900
CODEN: SWRABW

SELECTED WATER RESOURCES ABSTRACTS (SWRA) is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce.

SWRA is available to Federal agencies and their contractors or grantees in water resources research upon request, citing contract or grant number and sponsoring agency. Write: Office of Water Research and Technology, U.S. Department of the Interior, Washington, DC 20240. The **SWRA Journal** is also available on subscription from NTIS, 5285 Port Royal Road, Springfield, VA 22161. Annual subscription rates for the North American Continent are: Journal only, $100; Journal and Annual Indexes, $125; Indexes only, $50.Other addressees, write for prices.

Some documents abstracted in this journal can be purchased from NTIS. Price codes are given in the entries and a current code-price conversion table is printed on the outside back cover. Other documents are available from originating organizations or authors as indicated in the citation.

SELECTED WATER RESOURCES ABSTRACTS

A semimonthly publication of the Office of Water Research and Technology,
U.S. Department of the Interior

VOLUME 14, NUMBER 14
JULY 15, 1981

W81-02651 -- W81-02900

The Secretary of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

PREFACE

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. These documents cover water resources as treated in the life, physical, and social sciences and the related engineering and legal aspects of the characteristics, supply condition, conservation, control, use, or management of water resources. Each abstract includes a full bibliographic citation and a set of descriptors which are listed in the **Water Resources Thesaurus.** The abstract entries are classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the then Federal Council for Science and Technology.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several services of the Office of Water Research and Technology. The cumlative SWRA file from 1968 and monthly updates are available also in magnetic tape through lease from NTIS.

THE OFFICE OF WATER RESEARCH AND TECHNOLOGY DOES NOT PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Office of Water Research and Technology
U.S. Department of the Interior
Washington, D.C. 20240

CONTENTS

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions.

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

2. WATER CYCLE

2A. General

THE STRUCTURE OF HYDROCHEMICAL FIELDS AND SHORT-TERM PREDICTION,
Gidrokhimicheskii Inst., Rostov-na-Donu (USSR).
A. M. Nikanorov, B. M. Vladimirskiy, V. L. Pavelko, Y. V. Melniko, and K. L. Botsenyuk.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche.
In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, Aug 27-30, 79, Bloomfield Hills, MI. EPA Report 600/9-80-033, Jul 80. p 156-179, 4 Fig, 9 Tab, 7 Ref.

Descriptors: *Mathematical models, *Prediction, *Chemical properties, Anions, Cations, *Volga River(USSR), Mathematical studies, Reservoirs, Tributaries, Regression analysis, Factor analysis, Russia.

Empirical models are necessary to predict phenomena which do not have a theoretical interpretation. Analysis of the structure of hydrochemical fields and the resulting empirical descriptions are inseparably related both to the points of measurement selected and to the mathematical apparatus used. Some 30,000 previously published results of hydrochemical indices in reservoirs along the Volga River and its tributaries were used in factor and regression analyses. It was found that by selecting the concentration of calcium and bicarbonate ions, it was possible to predict four other variables-magnesium and chloride ions, the sum of ions, and total hardness. Parameters of the empirical models are determined which can be used to make the transition from integral charcteristics to particular characteristics for a predetermined point so that the spatial structure of the hydrochemical field may be determined. The methods of analysis suggested do not contradict the concept of the field used in hydrochemistry, and can be used in the prediction of space-time characteristics of hydrochemical indices, providing optimization of the network, with respect to spatial parameters and to time. (Brambley-SRC)
W81-02738

2B. Precipitation

PRELIMINARY ANALYSIS OF REGIONAL-PRECIPITATION PERIODICITY,
Geological Survey, Lawrence, KS. Water Resources Div.
C. A. Perry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161630, Price codes: A03 in paper copy, A01 in microfiche.
Geological Survey Water-Resources Investigations 80-74, September 1980. 26 p, 9 Fig, 22 Ref.

Descriptors: *Precipitation(Atmospheric), *Hydrologic cycle, *Droughts, *Climatology, *Meteorology, Time series analysis, Regional analysis, Magnetic studies, Variability, Cycles, Precipitation periodicity, Solar-weather interrelationships.

Precipitation variability plays a major role in nearly every aspect of the hydrologic cycle. Precipitation is not a random event, but it occurs after a sequence of prerequisites has been fulfilled. Recent investigations have shown that activity of the sun can affect atmospheric vorticity, an important factor in precipitation formation. Solar activity is known to be periodic; therefore, through a complex series of physical processes, precipitation variance is solar forced to a certain degree. A preliminary analysis of precipitation periodicity was made for eight regions scattered across the central United States. Each region contained 5 to 10 stations with long-term precipitation records that were averaged to obtain yearly regional-precipitation values. Graphic analysis shows 11-year and 22-year cycles that are nearly in phase with the solar cycles. An example of the effect of cyclic precipitation is presented for the Powder River basin in Wyoming and Montana. A cycle of 22 years exhibits fluctuations of approximately 22 to 27% for precipitation and 38 to 50% for runoff. A more detailed study that investigates solar-forced precipitation cycles and their relationship to hydrologic processes is needed. (USGS)
W81-02687

ANALYSES OF SOUTH AFRICAN RAINFALL,
Commonwealth Scientific and Industrial Research Organization, South Melbourne (Australia). Div. of Chemical Technology.
R. G. Vines.
South African Journal of Science, Vol 76, No 9, p 404-409, September, 1980. 10 Fig, 16 Ref.

Descriptors: *Rainfall, *Sunspots, *South Africa, *Cycles, Precipitation, Droughts, Weather, Australia, New Zealand, Tasmania, Forecasting, Weather forecasting.

Filter analysis of South African rainfall data in the south and northeast shows quasi-periodic fluctuations of 16-20, 10-12, and 6-7 years. The 16-20 and 6-7 year cycles are common to the whole country, but the 10-12 year wave in the south is out of phase with the northeast. Comparisons with precipitation data (some as far back as 1895) for southeast Australia, Tasmania, and New Zealand suggests correlation with the 10-12 year sunspot cycle. The results of the present analysis are in accord with Tyson and Dyer's estimate of the likelihood of extending drought conditions over much of South Africa in the mid 1980's. Although it is possible to suggest only broad estimates of future trends, even crude estimates could be useful for some planning purposes. (Cassar-FRC)
W81-02873

2E. Streamflow and Runoff

STREAMFLOW STATISTICAL SUMMARIES FOR COLORADO STREAMS THROUGH SEPTEMBER 30, 1975, VOLUME 2: COLORADO RIVER BASIN ABOVE GUNNISON RIVER,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02676

USING CHANNEL GEOMETRY TO ESTIMATE FLOOD FLOWS AT UNGAGED SITES IN IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 6A.
W81-02679

PRELIMINARY ANALYSIS OF REGIONAL-PRECIPITATION PERIODICITY,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 2B.
W81-02687

EVALUATION OF PEAK-FLOW DATA NETWORK OF SMALL STREAMS IN MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.
L. D. Hauth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-156242, Price codes: A03 in paper copy, A01 in microfiche.
Geological Survey Water-Resources Investigations 80-87, 1980. 38 p, 9 Fig, 8 Tab, 21 Ref.

Descriptors: *Peak discharge, *Small watersheds, *Missouri, *Flood frequency, Flood recurrence interval, Estimating, Regression analysis, Networks, Data collections, Stream gages, Evaluation.

Standard regression models were used as a tool to evaluate the transferability of streamflow characteristics for the small-streams network in Missouri. Station records were divided into segments and tested for adequacy of record length and sample size for two physiographic regions. The standard error of estimate for each calibrated regression model, using increasing record lengths, was compared against the longest period of record in both tests. Results of the study indicate that an increase in the length of small-area streamflow records or additional sampling sites in the data network will not substantially improve the standard error of estimate of the regression model. Therefore, it is recommended that the current (1980) crest-stage network be reduced to a sample large enough to measure the long-term trend and provide information for future capabilities in the field of small-streams hydrology. It is also recommended that additional research be carried out to determine additional variables which could be used to predict floodflows and other types of regression models. (USGS)
W81-02689

BEHAVIORAL AND CATASTROPHIC DRIFT OF INVERTEBRATES IN TWO STREAMS IN NORTHEASTERN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
D. J. Wangsness, and D. A. Peterson.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $1.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1101, December, 1980. 13 p, 6 Fig, 16 Ref.

Descriptors: *Invertebrates, *Streams, *Wyoming, *Aquatic drift, Mayflies, Midges, Baseflow, Runoff, Peak discharge, Powder River(WY), Clear Creek(WY), Behavioral drift, Catastrophic drift.

Invertebrate drift samples were collected in August 1977 from two streams in the Powder River structural basin in northeastern Wyoming. The streams are Clear Creek, a mountain stream, and the Little Powder River, a plains stream. Two major patterns of drift were recognized. Clear Creek was sampled during a period of normal seasonal conditions. High drift rates occurred during the night indicating a behavioral drift pattern that is related to the benthic invertebrate density and carrying capacity of the stream substrates. The mayfly genes Baetis, a common drift organism, dominated the peak periods of drift in Clear Creek. The Little Powder River has a high discharge during the study period. Midge larvae of the families Chironomidae and Ceratopogonidae, ususally not common in drift, dominated the drift community. The dominance of midge larvae, the presence of several other organisms not common in drift, and the high discharge during the study period caused a catastrophic drift pattern. (USGS)
W81-02702

DEVELOPMENT OF A STREAMFLOW FORECASTING PROCEDURE FOR INTERMOUNTAIN BASINS,
Montana State Univ., Bozeman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W81-02726

FLOOD FREQUENCY MODELING AND OUTLIERS,
Illinois State Water Survey, Urbana.
K. P. Singh.
In: Proceedings of the Specialty Conference on Computer and Physical Modeling in Hydraulic Engineering, ASCE/August 6-8, 1980, Chicago. p 74-85 (1980). 10 Ref.

Descriptors: *Illinois, *Flood frequency, *Standard deviation, *Statistical methods, Flood flow, Flood data, Flood profiles, Flood recurrence interval, Flood forecasting, Flood basins, Flood peak, Model studies, Flood plains.

The U.S. Water Resources Council recommends a methodology to promote uniform, consistent and accurate techniques for determining flood-flow frequency. Using the Sangamon River basin in central Illinois to illustrate the effects of various factors on flood frequencies, this report analyzes the Council's procedure with emphasis on the detection of outliers---the observations in a set of data that

appear to be inconsistent with the remainder of the data. The report concludes that the criterion for low flood outliers is too severe, resulting in low values (algebraically) of skew. A methodology is developed and applied to modify low and/or high outliers; statistics of storms producing floods perceived as high outliers, and the associated antecedent soil moisture conditions, can be used for confirming high outliers. It is suggested that the Council's methodology for regionalization of skew values can be more precise and meaningful if the outliers are modified before analyzing the flood series. The statistically best plotting position was found to be superior to the Weibull plotting position for testing the goodness of fit of the derived flood distribution curve and the observed floods. (Garrison-Omniplan)
W81-02803

SOME ECOLOGICAL OBSERVATIONS ON ENVIRONMENTAL PARAMETERS, PLANKTONIC SEASONAL SUCCESSION AND BIOMASS IN RIO CRUCES (PROV. VALDIVIA), SOUTH CHILE,
Giessen Univ. (Germany, F.R.). Inst. fuer Pflanzenoekologie.
For primary bibliographic entry see Field 5C.
W81-02876

2F. Groundwater

SURFICIAL GEOLOGY OF NEW HAVEN QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
For primary bibliographic entry see Field 7C.
W81-02661

SURFICIAL GEOLOGY OF ORWELL QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02662

SURFICIAL GEOLOGY OF PART OF LYSANDER QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
For primary bibliographic entry see Field 7C.
W81-02663

SURFICIAL GEOLOGY OF REDFIELD QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
For primary bibliographic entry see Field 7C.
W81-02664

SURFICIAL GEOLOGY OF PART OF BOYLSTON CENTER QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02665

SURFICIAL GEOLOGY OF PART OF SANDY CREEK QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02666

SURFICIAL GEOLOGY OF PART OF WORTH CENTER QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02667

SURFICIAL GEOLOGY OF OSWEGO WEST QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02668

SURFICIAL GEOLOGY OF OSWEGO EAST QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
For primary bibliographic entry see Field 7C.
W81-02669

SURFICIAL GEOLOGY OF CENTRAL SQUARE QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
For primary bibliographic entry see Field 7C.
W81-02670

SURFICIAL GEOLOGY OF MEXICO QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
For primary bibliographic entry see Field 7C.
W81-02671

GROUND-WATER QUALITY AND DATA ON WELLS AND SPRINGS IN PENNSYLVANIA, VOLUME I--OHIO AND ST. LAWRENCE RIVER BASINS,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02675

SELECTED WATER-LEVEL RECORDS FOR OKLAHOMA, 1979-80,
Geological Survey, Oklahoma City, OK. Water Resources Div.
W. B. Mills, and D. E. Spiser.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $7.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-975, November 1980. 55 p, 1 Fig, 1 Tab.

Descriptors: *Oklahoma, *Water wells, *Water levels, *Aquifers, Water levels fluctuations, Basic data collections.

A systematic program to collect water-level records in Oklahoma began in 1937. The objectives of this program are (1) to provide long-term records of water-level fluctuations in representative wells, (2) to facilitate the prediction of water-level trends and indicate future availability of groundwater supplies, and (3) to provide information for use in basic research. This report includes water-level data from wells measured annually, prior to the irrigation season, to achieve the most natural representation of the static water level; and the counties and number of wells there in, where data were obtained.
W81-02683

GEOHYDROLOGY OF THE DELTA-CLEARWATER AREA, ALASKA,
Geological Survey, Anchorage, AK. Water Resources Div.
D. E. Wilcox.
Geological Survey Water-Resources Investigations 80-92, 1980. 26 p, 13 Fig, 4 Tab, 14 Ref.

Descriptors: *Hydrogeology, *Groundwater, *Aquifers, *Surface-groundwater relationships, *Alaska, Areal hydrogeology, Aquifer characteristics, Water levels, Potentiometric level, Groundwater recharge, Groundwater movement, Water wells, Water yield, Influent streams, Discharge(Water), Water quality, Planning, Hydrographs, *Delta-Clearwater area.

The alluvial aquifer in the Delta-Clearwater area, Alaska, is composed of lenticular, interbedded deposits of silt, sand, and gravel. Ground water occurs under both confined and unconfined conditions in the area. The potentiometric surface slopes approximately northward at gradients ranging from about 1 to 25 feet per mile. The aquifer is recharge by seepage through the streambeds of rivers and creeks and by infiltration of precipitation. Water is discharged from the aquifer into the Clearwater Creek network and Clearwater Lake, which are almost entirely spring-fed, at the mouth of the Delta River, and into the Tanana River along the northern boundary of the study area. Year-round ground-water discharge from the aquifer is estimated to exceed 1,200 cubic feet per second. The following ground-water flow system is hypothesized: Channel losses from the Gerstle River, several small creeks draining the Alaska Range, and the Tanana River to the east of Clearwater Creek recharge the sections of the aquifer discharging at the Clearwater Creek network. Channel losses from the Delta River and Jarvis Creek are the main source of recharge to the sections of the aquifer discharging in the vicinity of Clearwater Lake and Big Delta. Additional work is needed to verify these hypotheses. (USGS)
W81-02688

SEAWATER INTRUSION AND POTENTIAL YIELD OF AQUIFERS IN THE SOQUEL-APTOS AREA, SANTA CRUZ COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W81-02690

GROUNDWATER HYDROLOGY OF JAMES CITY COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
J. F. Harsh.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO. 80225, Price: $21.25 in paper copy, $5.50 in microfiche. Geological Survey Open-File Report 80-961 (WRI), September, 1980. 73 p, 22 Fig, 4 Plates, 6 Tab, 32 Ref.

Descriptors: *Groundwater resources, *Sand aquifers, *Aquifer characteristics, *Coastal Plains, *Virginia, Hydrogeology, Groundwater availability, Groundwater movement, Potentiometric level, Water quality, Saline water-freshwater interfaces, Water resources development, *James City County.

Urbanization and increase in water demand prompted a 2-year study of groundwater availability and quality in the county of James City. The coastal-plain sediments, parts of which underlie the county, are the largest source of groundwater in Virginia. Four aquifers form the complex aquifer system. Hydraulic characteristics vary from aquifer to aquifer and from place to place. The Cretaceous aquifer furnishes nearly all the water for industrial and municipal needs. Movement of water in the Cretaceous aquifer is toward cones of depression formed by pumping centers at Williamsburg and Dow Badische Co. All aquifers contain water that generally meets State standards for drinking water. Water in the Cretaceous aquifer is of the sodium chloride bicarbonate type. As depth of aquifer increases, the concentrations of dissolved solids and chloride also increase. Saline water (more than 250 milligrams per liter) occupies the deeper parts of the confined aquifers. The amount of water stored in the coastal sediments is estimated to be 650-1300 billion gallons. An increase in pumpage to accomodate the expected daily demand of 9.8 million gallons per day in year 2000 is feasible provided pumpage is distributed over the county. (USGS)
W81-02695

APPRAISAL OF GROUND-WATER RESOUCES IN THE SAN ANTONIO CREEK VALLEY, SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W81-02700

RELATIONSHIPS BETWEEN BASIC SOILS-ENGINEERING EQUATIONS AND BASIC GROUND-WATER FLOW EQUATIONS,
Geological Survey, Lawrence, KS. Water Resources Div.
D. G. Jorgensen.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $2.50. Geological Survey Water-Supply Paper 2064, 1980. 40 p, 9 Fig, 1 Tab, 41 Ref.

Descriptors: Groundwater, *Soil engineering, *Equations, *Groundwater movement, Porosity, Void ratio, Compressibility, Consolidation, Storage, Soil compaction, Hydraulic conductivity, Unsteady flow, Modulus of elasticity.

Equations for the Terzaghi theory of consolidation and equations for ground-water flow are identical under specific conditions. A combination of the two sets of equations relates porosity to void ratio, and relates the modulus of elasticity to the coefficient of compressibility, coefficient of volume compressibility, compression index, coefficient of consolidation, specific storage, and ultimate compaction. Also transient ground-water flow is related to coefficient of consolidation, rate of soil compaction, and hydraulic conductivity. Examples show that soils engineering data and concepts are useful to solution of problems in ground-water hydrology. The many varied but related terms developed by ground-water hydrologists and soils engineers are useful to each discipline, but the difference in concepts hinders the use of related terms in interdisciplinary studies. (USGS)
W81-02708

2G. Water In Soils

RELATIONSHIPS BETWEEN BASIC SOILS-ENGINEERING EQUATIONS AND BASIC GROUND-WATER FLOW EQUATIONS,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02708

AIRCRAFT REMOTE SENSING OF SOIL MOISTURE AND HYDROLOGIC PARAMETERS, CHICKASHA, OKLA., AND RIESEL, TEX., 1978 DATA REPORT,
Science and Education Administration, Beltsville, MD. Hydrology Lab.
T. J. Jackson, T. J. Schmugge, G. C. Coleman, C. Richardson, and A. Chang.
Agricultural Research Results ARR-NE-8, August 1980. 52 p, 18 Fig, 29 Tab, 1 Append.

Descriptors: *Remote sensing, *Soil water, *Aerial photography, *Infrared imagery, Rainfall, Semiarid lands, Data acquisition, Soil moisture retention.

Experiments were designed and conducted to develop a data set for the analysis of relationships between remote sensing data and hydrologic variables and parameters. The data were collected on May 1, 12, and 30, 1978 in two semiarid areas, Chickasha, Oklahoma and Riesel, Texas. The NASA 929 aircraft was the sensor platform used in these experiments. A nominal altitude of 305 m and a ground speed of 278 km/hour were chosen. The systems used were: color infrared photography, a modular multispectral scanner, a thermal infrared radiometer, multifrequency microwave radiometers, (a passive microwave scanner and multifrequency active microwave scatterometers). Ground observations of soil moisture, pan evaporation, daily maximum and minimum temperatures, and daily rainfall were made in both areas. This particular series was considered successful. However, additional experiments are needed to cover a wider range of soil moisture conditions within semiarid areas. (Moore-SRC)
W81-02782

2H. Lakes

RESULTS OF A JOINT USA/USSR HYDRODYNAMIC MODELING PROJECT FOR LAKE BAIKAL,
Environmental Research Lab.-Duluth, Grosse Ile, MI. Large Lakes Research Station.
J. F. Paul, A. B. Gorstko, and A. A. Matveyev.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Mangement, August 27-30, 1979, Bloomfield Hills, Michigan. Environmental Protection Agency Report 600/9-80-033, July 1980. p 129-155, 1

Descriptors: *Water circulation, *Hydrodynamics, *Suspended solids, *Dissolved solids, Turbulent flow, Water currents, Wind-driven currents, International agreements, Phosphates, *Mathematical models, Lake Baikal, *Russia.

Project 02.02-12, Protection and Management of Water Quality in Lakes and Estuaries, was initiated as part of the USA/USSR Agreement on Cooperation in the Field of Environmental Protection of 1972. Scientists of the two countries compared formulations and results of hydrodynamic and transport models to provide a basis for further verification of lakewide and nearshore models. The model developed has two components, the basic hydrodynamic calculation and the dispersion of dissolved and/or suspended material. The equations for the hydrodynamic component are derived from the time-dependent, three-dimensional equations for conservation of mass, momentum, and energy. The transport and dispersion of material in the turbulent flow is described in a manner similar to that used for the transport and turbulent dispersion of heat and momentum. Surface currents are calculated in relation to wind direction; the model was in good agreement with observed values. Using the steady-state currents that were calculated, the transport and dispersion of phosphate ion and total suspended solids were calculated for each of the four main wind directions. The calculated distributions were in general agreement with observed data. (Brambley-SRC)
W81-02737

A MULTI-LAYERED NESTED GRID MODEL OF LAKE SUPERIOR,
Minnesota Univ., Duluth. Dept. of Physics.
G. J. Oman, and M. Sydor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models of Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, MI. EPA Report 600/9-80-033, July, 1980. p 207-236, 15 Fig, 42 Ref, 1 Append.

Descriptors: *Mathematical models, *Lake Superior, *Water circulation, Lakes, Hydrological models, Limnology, Model studies, *Bathymetry, Thermal stratification, Remote sensing, Satellite technology.

The size and complex bathymetry of Lake Superior pose serious obstacles when attempting to understand lake dynamics. An understanding of the physical processes occurring in Lake Superior will probably best be achieved by means of numerical modeling in conjunction with remote sensing data and direct measurements made on the lake. Existing three-dimensional Great Lakes models were reviewed to find an appropriate model for Lake Superior. The decision was made to first develop and verify an isothermal model before dealing with the much more difficult task of simulating stratified flows. The Lake Superior model is similar to Leendertse's estuary model. It ignores vertical accelerations and assumes pressure varies hydrostatically. It has a free surface, and uses constant eddy coefficients to represent vertical and horizontal diffusion. Horizontal and vertical advection of momentum are represented using an energy conserving formulation. Centered space differences are used for all terms. In order to assure adequate spatial solution in regions of interest, a nested grid model is used. The complex bathymetry and highly variable thermal structure of Lake Superior can be handled more conveniently with layers of fixed depth, letting only the bottom layer vary in thickness. The model was run for 24 hour periods for easterly and westerly winds on Lake Superior, and on a 2.5 km nested subgrid in extreme western Lake Superior. Results are consistent with Landsat observations. (Moore-SRC)
W81-02741

A SEGMENTED MODEL OF THE DYNAMICS OF THE ECOSYSTEM OF LAKE BAIKAL CONSIDERING THREE-DIMENSIONAL CIRCULATION OF THE WATER,
Akademiya Nauk SSSR, Leningrad. Inst. Evolyutsionnoi Fiziologii i Biokhimii.
V. V. Menshutkin, O. M. Kozhova, L. Y. Ashchepkova, and V. A. Krotova.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, Aug 27-30, 79, Bloomfield Hills, MI. EPA Report 600/9-80-033, Jul 80, p 366-378. 5 Fig, 15 Ref.

Descriptors: *Aquatic environment, *Model studies, *Seasonal distribution, *Ecosystems, *Lakes Hydrologic systems, Phytoplankton, Zooplankton, Water circulation, Bacteria, Nutrients, Detritus, Mathematical models, Solar radiation, Water temperature, Organic matter, Water quality, Lake Baikal, *Russia.

A model of the seasonal dynamics of the pelagic ecosystem of Lake Baikal, USSR, is described, the main components of which are the phytoplankton, zooplankton, bacteria, nutrients and detritus. The surface of the lake is arbitrarily divided into 65 areas of equal size, and the volumes of water divided into two zones: the photosynthetic and destructive zones. The input functions of time include absorbed solar radiation, water temperature, and the inputs of organic matter from the largest sources of the lake. In calculating the status vector of an ecosystem, biologic and hydrologic processes are considered in each step. The redistribution of dissolved and suspended matter within the mass of water is performed in the model by means of horizontal advection and vertical turbulent mixing. The speed and direction of horizontal transfer in each region are constant throughout the year and correspond to the overall system of water circulation in the lake. The turbulent flows are proportional to the vertical gradients of matter. On the whole, the dynamics of spatial distribution of plankton demonstrated by the model agree well with the data of actual surveys made in Lake Baikal. One major advantage of the model is the fact that it enables the tracing of the path of propagation of matter entering the lake, and considers its transformation in the biological system. (Moore-SRC)
W81-02747

A TWO-MODE FREE-SURFACE NUMERICAL MODEL FOR THE THREE-DIMENSIONAL TIME-DEPENDENT CURRENTS IN LARGE LAKES,
Case Western Reserve Univ., Cleveland, OH.
Y. P. Sheng, and W. Lick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197809, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-047, May 1980. 70 p, 29 Fig, 34 Ref, 2 Append. R-803704.

Descriptors: *Model studies, *Mathematical models, *Water currents, *Lake Erie, Vertical flow, Wind-driven currents, Prediction, Free-surfaces, Mathematical analysis, Hydrologic models.

Since Lake Erie is the shallowest of the Great Lakes, the effects of vertical diffusion and bottom shear stress are more pronounced than in the other

Great Lakes. The numerical stability criterion associated with the vertical diffusion terms in the governing equations is also much more stringent. To resolve this problem a two-mode, free-surface model based on vertically-stretched coordinates and a vertically-implicit scheme has been developed and applied to Lake Erie under non-stratified conditions. A brief description of the general equations and boundary conditions is first given. The detailed equations for a two-mode, free-surface model are then described. Finite-difference procedures including the finite-difference equations are listed in detail. The model is first applied to idealized basins and then to Lake Erie for two wind conditions; a uniform wind suddenly imposed, and an actual wind variable in both space and time. The results of the computations are compared with the results from a single-mode, free-surface model and from a rigid-lid model. The surface elevations compare well with those computed by a single-mode free-surface model. The currents as predicted by the rigid-lid model are generally smaller than those predicted by the free-surface model. The present model requires more computer time than does a rigid-lid model but less than a single-mode free-surface model, and is superior to the rigid-lid model in that it does not eliminate currents associated with free-surface oscillations. (Brambley-SRC)
W81-02778

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF LAKE ELLYN SEDIMENTS.
Illinois State Water Survey, Urbana.
Progress Report to the Northeastern Illinois Planning Commission, SWS Contract Report 243, (1980) 20 p, 1 Fig, 11 Tab, 4 Ref.

Descriptors: *Illinois, *Lake sediments, *Water analysis, Chemical analysis, Macroinvertebrates, Chemical sludge, Sediment yield, Lake soils, Storm runoff, Storm drainage, Storm water, Urban runoff, Surface runoff, Heavy metals, Chemical properties, Physical properties, Biological properties.

As part of the major efforts undertaken by the Northeastern Illinois Planning Commission under the National Urban Runoff Program to evaluate the water quality effects of storm water detention storage, the Water Quality Section of the Illinois State Water Survey carried out field and laboratory investigations to characterize the physical, chemical, and biological nature of the bottom sediments of Lake Ellyn. Five field sampling trips during 1979-1980, and subsequent laboratory analyses, provided the following results. In the physical characteristics category, sediment moisture content at station No 1 was found to be the lowest, progressively increasing toward the outlet; the volatile fraction of the solids was the highest at the inlet, but decreased progressively toward the outlet. No discernible trend in particle size distribution was found. For chemical characteristics, concentrations of chromium, copper, iron, lead, mercury and zinc were found in all sediment samples, as determined by atomic absorption spectroscopy. Arsenic and chromium concentrations were determined by the Inductively Coupled Plasma (ICP) method. The report also lists pH, various forms of nitrogen, total phosphorus, and grease and oil found in the sediments. Under biological characteristics, the predominant benthic organisms in Lake Ellyn were found to be Chaoborus and Chironomidae, which are essentially pollution-tolerant. (Garrison-Omniplan)
W81-02793

TURNOVER RATE OF DISSOLVED ORGANIC MATERIALS IN GLACIALLY-OLIGOTROPHIC AND DYSTROPHIC LAKES IN BRITISH COLUMBIA, CANADA,
Tsukuba Univ., Ibaraki (Japan). Inst. of Biological Sciences.
H. Seki, K. S. Shortreed, and J. G. Stockner.
Archiv fur Hydrobiolgie, Vol 90, No 2, p 210-216, October, 1980. 1 Fig, 2 Tab, 11 Ref.

Descriptors: *Oligotrophy, *Organic matter, *Lakes, Dystrophy, Trophic level, Eutrophication, Lake stages, Canada, *British Columbia.

Glacial and dystrophic lakes located in British Columbia were used to study the dynamics of dissolved organic materials. The study was conducted during the summer stratification period in 1979. All the lakes studied had low levels of one or more of the basic algal nutrients. Common features of rapid flushing, low base nutrient load and weak stratification with deep mixing throughout the year have contributed to the lakes' oligotrophic status. In dystrophic Lowe and Bonilla lakes the concentrations of both nitrogen and phosphorus are low, and distinct summer depletion of epilimnetic nitrogen occurred. In the surface of all glacial and dystrophic lakes, freshwater microorganisms with an optimum activity of 0.5% salinity were predominant, even though microorganisms in the glacial lakes showed a more euryhaline characteristic than those in the dystrophic lakes. The concentrations of amino acids and carbohydrates in situ in the lakes were mostly one order of magnitude lower than those in eutrophic watermasses, but those of organic acids were of almost the same level as those in eutrophic watermasses. (Baker-FRC)
W81-02806

***INTERACTIONS OF LIGHT AND NITROGEN* SOURCE AMONG PLANKTONIC BLUE-GREEN ALGAE,**
Alabama Univ., University. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W81-02807

MOLECULAR WEIGHT DISTRIBUTION AND CHARACTERIZATION OF DISSOLVED ORGANIC MATTER FROM LAKE WATERS,
Nagoya Univ. (Japan). Water Research Inst.
T. Hama, and N. Handa.
Archiv fur Hydrobiologie, Vol 90, No 1, p 106-120, September, 1980. 5 Fig, 4 Tab, 41 Ref.

Descriptors: *Lakes, *Organic matter, Carbohydrates, Amino acids, Proteins, Solutes, Dissolved organic carbon, *Japan.

The molecular weight distributions of dissolved organic carbon (DOC), dissolved carbohydrates, amino acids, proteins, and organic acids in samples from three lakes in Japan were investigated with the aid of Sephadex G-25 gel filtration. DOC consisted to a considerable extent of low molecular weight organic materials in all of the water samples studied. Carbohydrates consisted of mainly high molecular weight polymers, while amino acids and proteins were distributed evenly in low through high molecular weight fractions, without any dramatic change in the concentration. Volatile organic acids were only found in the low molecular weight fraction. These organic compounds accounted for 16.5-20.6% of the DOC, thus more than 80% of the DOC was left undetermined. (Baker-FRC)
W81-02877

THE MACROBENTHOS OF LAKES ROTOROA AND ROTOITI, SOUTH ISLAND, NEW ZELAND, WITH SPECIAL REFERENCE TO THE INFLUENCE OF ALLOCHTHONOUS ORGANIC DETRITUS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
B. V. Timms.
Archiv fur Hydrobiologie, Vol 90, No 2, p 182-196, October, 1980. 4 Fig, 4 Tab, 24 Ref.

Descriptors: *Benthos, *Lakes, Lake Rotoroa, Lake Rotoiti, *New Zealand, Decomposing organic matter, Distribution patterns, Glacial lakes, Mesotrophy, Aquatic productivity.

The mesotrophic glacial lakes, Lakes Rotoroa and Rotoiti, have substrates enriched at their southern inflow ends by natural allochthonous organic debris. Twenty macrobenthic species were found in Lake Rotoroa and 25 in Lake Rotoiti. The following species were numerous in both lakes: Lumbriculus variegatus, Limnodrilus hoffmeisteri, Phreodrilus spp., Macropelopia spp., Chironomus spp., Potamopyrgus antipodarum, and Sphaerium novaezealandiae. It is suggested that this low number of different species is largely caused by a combination of zoogeographic isolation and the lack of distinct seasonal markers in a climate background known for its vagrancies, thereby providing few reliable environmental cues. Standing crops were unexpectedly high in each lake, but particularly so in Lake Rotoroa, for lakes considered to be mesotrophic. Observation of the area would suggest that there is considerable natural input of organic detritus, mainly beech leaves and twigs. (Baker-FRC)
W81-02880

RELATIONSHIP BETWEEN HETEROTROPHIC BACTERIA AND PHYTOPLANKTON IN LAKE MERGOZZO AND LAKE BIWA,
Kyoto Univ. (Japan). Dept. of Fisheries.
Y. Ishida, M. Nakaji, and H. Kadota.
Archiv fur Hydrobiologie, Vol 88, No 4, p 450-457, June, 1980. 4 Fig, 1 Tab, 6 Ref.

Descriptors: *Bacteria, *Lake morphology, *Lake morphometry, Hypolimnion, Eutrophication, Microorganisms, Aquatic bacteria, Limnology, Lakes, *Japan, Lake Mergozzo, Lake Biwa.

Water samples collected from various depths in Lake Mergozzo and Lake Biwa were filtered through 5 micron mesh nets, and the relationships between phytoplankton and the L-bacteria in whole water and those attached to the particles larger than 5 micron in diameter were determined. The number of L-bacteria grown on nutrient-poor medium was always considerably larger than that of H-bacteria grown on nutrient-rich medium when compared with the whole water body. Particularly in the hypolimnion, a larger percentage of L-bacteria was present in particles larger than 5 micron. The findings support the theory that the L-bacteria attach to phytoplankton and its debris and are carried by them from epilimnion to hypolimnion through metalimnion. It is also suggested that phytoplankton are significant factors in the production in lake water of bacteria, especially L-bacteria, by supplying, them with solid surface to which to attach themselves. L-bacterial populations appeared most strongly assoicated with particles larger than 5 microns. It is concluded that L-bacteria often dominate in lake waters, especially in oligotrophic lakes. (Baker-FRC)
W81-02881

2I. Water In Plants

IRRIGATION OF CROPS IN THE SOUTHEASTERN UNITED STATES, PRINCIPLES AND PRACTICE,
Southern Piedmont Conservation Research Center, Watkinsville, GA.
For primary bibliographic entry see Field 3F.
W81-02780

2J. Erosion and Sedimentation

FIELD DATA DESCRIBING THE MOVEMENT AND STORAGE OF SEDIMENT IN THE EAST FORK RIVER, WYOMING. PART I. RIVER HYDRAULICS AND SEDIMENT TRANSPORT, 1979,
Geological Survey, Denver, CO. Water Resources Div.
W. W. Emmett, R. M. Myrick, and R. H. Meade.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $6.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1189, 1980. 43 p, 2 Fig, 19 Tab, 14 Ref.

Descriptors: *Sediment transport, Rivers, *Streamflow, *Fluvial sediments, *Wyoming, Bed load, Bed load samples, Sediment discharge, Particle size, Sedimentation rates, Stage-discharge relations, Data collections, *East Fork River(WY), Helley-Smith bedload sampler.

Bed-material gradation and water-surface slope were determined for a 3.3-kilometer reach of East Fork River, Wyo. During peak snowmelt runoff, frequent measurements of water discharge and sediment-transport rate provided data describing

the inflow and outflow of water and sediment. In spring 1979, bankfull stage was exceeded on 8 days. Maximum discharge was about 32 cubic meters per second, which has a recurrence interval of about 2 years. The median particle size of bed material is 1.28 millimeters; the 35 and 65 percentiles are represented by diameters of 0.50 and 2.88 millimeters, respectively. The average water-surface slope in the reach is 0.0007 and varies little with river stage. Bedload-transport rates ranged from a little less than 0.001 to a little more than 0.1 kilograms per meter of channel width per second. Median bedload grain size, with several exceptions, ranged from 0.4 to 1.5 millimeters. Gravel-size particles generally constituted 10 to 40% of the bedload. Suspended-sediment concentrations ranged from 6 to 95 milligrams per liter. Suspended sediment smaller than sand constited about half the measured suspended sediment, ranging from 17 to 81%. (USGS)
W81-02704

FIELD DATA DESCRIBING THE MOVEMENT AND STORAGE OF SEDIMENT IN THE EAST FORK RIVER, WYOMING, PART II, BED ELEVATIONS, 1979,
Geological Survey, Denver, CO. Water Resources Div.
R. H. Meade, R. M. Myrick, and W. W. Emmett.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $22.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1190, 1980. 171 p, 1 Fig, 42 Tab, 11 Ref.

Descriptors: *Streambeds, *Bed load, *Streamflow, *Channel erosion, *Wyoming, Scour, Sediment transport, Sediment discharge, Measurement, Data collections, *East Fork River(WY).

At 39 cross sections in a 3.3-kilometer reach of East Fork River Wyo., bed elevations were measured daily during a month-long period that included the peak snowmelt runoff. Elevations were measured at less frequent intervals for a week before and several weeks after peak runoff. Considerable scour and fill was recorded at many of the cross sections. (USGS)
W81-02705

BANK EROSION OF THE ILLINOIS RIVER,
Illinois State Water Survey, Urbana.
N. G. Bhowmik, and R. J. Schicht.
Illinois Institute of Natural Resources, Report of Investigation 92, 1980. 52 p, 27 Fig, 7 Tab, 20 Ref.

Descriptors: *Illinois, *Bank erosion, Flow velocity, *Rivers, *Stream banks, Bed sediment, Erosion control, Silting, Sedimentation, Sediment load, Waves, Wind erosion, Lake breezes, Lake sediments, Reach, *Illinois River.

As part of a 5-year study to determine the effects of increased Lake Michigan diversion on water quality of the Illinois River and on its susceptibility to additional flooding, bank erosion was investigated by making a field inspection from Joliet to Grafton. It was found, in general, that the silty, sandy, and clayey materials of these severely eroded banks should be stable against the action of tractive force and flow velocity. However, preliminary computations indicated that the banks are unstable as far as the wind-generated wave action is concerned. It is suspected that river traffic-generated wave action also has a similar effect. Extensive bed and bank material samples were collected and grain size distributions were determined. After developing plan views of twenty selected sites, the bank slopes at these reaches were determined and the stability of the banks at all twenty locations was tested and anlyzed. As far as the flow hydraulics are concerned, bank erosion will not be affected by the proposed increase in diversion. A monitoring program is outlined and future research on wave action is suggested. Bank erosion attracts public attention, reduces property value, results in permanent loss of real estate, increases stream turbidity, and accelerates the silting of reservoirs or backwater lakes along the stream course. (Garrison-Omniplan)
W81-02791

DYNAMICS OF SEDIMENT AND ORGANIC DETRITUS IN A SMALL CHALK STREAM,
Freshwater Biological Association, Dorset (England). River Lab.
J. S. Welton.
Archiv fur Hydrobiologie, Vol 90, No 2, p 162-181, October, 1980. 11 Fig, 5 Tab, 33 Ref.

Descriptors: *Detritus, *Erosion, Streams, Sediments, Nutrients, Decomposing organic matter.

A study was made of the seasonal variation in amounts of detritus present in a small chalk stream in relation to the changes in macrophyte cover and community composition. The origin of the detritus present was studied, along with the accumulation rates of detritus in different parts of the stream. The maximum discharge was noted to occur during the autumn or winter. Other marginal vegetation showed a similar seasonal pattern. Detritus volume increased by 500% over the study period, corresponding to increased marginal vegetation caused by the cessation of bankside trimming and the generally low discharges occurring in 1973 and 1974. The analysis of collected sediment showed a decrease in size during the summer as the water velocity decreased, the sand became less dominant, and the fecal material increased. A decrease was noted in the percentage of organic content as the size fraction became smaller, and the organic content was lower in winter than in summer. (Baker-FRC)
W81-02879

2K. Chemical Processes

GEOCHEMISTRY OF FLUORIDE IN THE BLACK CREEK AQUIFER SYSTEM OF HORRY AND GEORGETOWN COUNTIES, SOUTH CAROLINA--AND ITS PHYSIOLOGICAL IMPLICATIONS,
Geological Survey, Columbia, SC. Water Resources Div.
For primary bibliographic entry see Field 5G.
W81-02677

SELECTED CHEMICAL QUALITY CHARACTERISTICS IN STREAMS OF KENTUCKY, 1970-75.
Geological Survey, Louisville, KY. Water Resources Div.
Geological Survey Water-Resources Investigations 79-21 (open-file report), 1980. 1 Sheet, 10 Ref. (Santos, J. F., complier).

Descriptors: *Water quality, Chemical reactions, *Streamflow, *Groundwater, *Kentucky, Data collections, Dissolved solids, Hardness(Water), Nitrates, Maps.

Generalized maps of average dissolved solids, hardness and nitrate concentrations of water in streams throughout Kentucky were prepared from data collected at more than 100 sites from 1970 to 1975. Average dissolved solids concentrations seldom exceed 250 milligrams per liter. Hardness, mostly of calcium magnesium origin, generally ranges from 60 to 180 milligrams per liter. Average nitrate concentrations exceed 2 milligrams per liter at most of the sites. (USGS)
W81-02680

SPECIES DEPENDENT MASS TRANSPORT AND CHEMICAL EQUILIBRIA: APPLICATION TO CHESAPEAKE BAY SEDIMENTS,
Manhattan Coll., Bronx, NY. Environmental Engineering and Science Program.
D. M. Di Toro.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, Michigan. Environmental Protection Agency Report EPA 600/9-80-033, July 1980. p 85-12

Descriptors: *Mass transfer, *Chemical reactions, *Bottom sediments, Anions, Cations, *Chesapeake Bay, Equilibrium, Gases, Alkalinity, Interstitial water, Mathematical analysis.

A comprehensive analysis is necessary in order to understand the interrelationships between sediments and interstitial waters, and to establish the primary controlling factors. Equations of mass balance and chemical eequilibrium are combined into a single structure for the analysis of sediment interstitial water and gas phase concentrations. For the Chesapeake Bay station analyzed it appears to be a reasonable approximation to compute the distribution of the species with the components C, H, O, and S using the requirements of chemical equilibrium, but not the nitrogen species. The gas phase-aqueous phase reactions at equilibrium correspond to the case of slow gas phase motion. For species dependent transport the computations reproduce the major features of the observed data as well as the more detailed variations of the C to N ratio and the net alkalinity. The computational framework provides the means for examining the relative impact of various mechanisms that affect net alkalinity and the other species. For more complete analysis a very comprehensive data set is required, including not only the complete interstitial water chemistry but also a detailed analysis of the sediment solid phases, with both organic material and inorganic phases characterized. (Brambley-SRC)
W81-02735

2L. Estuaries

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1974-SEPTEMBER 1975,
Geological Survey, Houston, TX. Water Resources Div.
W. B. Lind.
Texas Department of Water Resources Report 245, April 1980. 291 p, 13 Fig, 9 Tab, 13 Ref.

Descriptors: *Chemical properties, *Physical properties, *Water quality, *Estuaries, *Texas, Data collections, Sampling, Sites, Water analysis, Chemical analysis, Organic compounds, Inorganic compounds, Trace elements, Nutrients, Insecticides, Bacteria, Coliforms, Chlorophyll.

Approximately 290 data-collection sites were visited in estuaries of Texas during the 1975 water year. At each data-collection site, field data are collected from several points along a vertical. Samples for laboratory analyses are collected from a predetermined number of data-collection sites and at other sites in the network when significant changes in field data indicate a need for additional samples. Properties or constituents measured in the field are dissolved oxygen, specific conductance, temperature, pH, transparency by Secchi disk, and turbidity. Laboratory analyses include the principal inorganic ions, biochemical oxygen demand, phenols, total organic carbon, dissolved organic carbon, suspended organic carbon, chlorophyll, coliform and streptococci bacteria, insecticides and herbicides, ammonium, nitrite, nitrate, ortho and total phosphate, and other selected ions such as aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, nickel, strontium, and zinc. (USGS)
W81-02684

VEGETATIVE PROPAGATION OF SOME SAPROLEGNIACEAE UNDER SIMULATED-ESTUARINE-CULTURE CONDITIONS,
North Carolina Univ. at Wilmington. Dept. of Biology.
D. E. Padgett.
Mycologia, Vol 72, No 2, p 410-415, 1980. 1 Fig, 1 Tab, 8 Ref.

Descriptors: *Fungi, *Aquatic fungi, *Estuaries, Saline water, Microbiology, Microorganisms, Laboratory tests, Vegetation propagation.

Laboratory studies of saprolegniaceous fungi demonstrated that vegetative propagation occurred under simulated estuarine salinity cycles which do not permit asexual sporulation. Mycelial macerates of Achyla americana did not infect fresh bait in a 1

to 10 ppt salinity cycle. The two isolates of A. flagellata differed in behavior. Isolate 66 produced infestation in 1 to 10 ppt cycling; Isolate 67 propagated in 0 to 10 and 3 to 12 ppt salinity. Saprolegnia parasitica infested bait in 0 to 10 and 3 to 12 regimes; Thraustotheca clavata, in 0 to 12, 3 to 15, 5 to 18 ppt cycles. Therefore, saline waters may not necessarily prevent propagation of water molds. (Cassar-FRC)
W81-02814

FACTORS INFLUENCING PARTICULATE MATTER GEOCHEMISTRY IN THE ST. LAWRENCE ESTUARY TURBIDITY MAXIMUM,
Quebec Univ., Rimouski. Dept. of Oceanographic.
C. Gobeil, B. Sundby, and N. Silverberg.
Marine Chemistry, Vol 10, No 2, p 123-140, 1981. 8 Fig, 3 Tab, 45 Ref.

Descriptors: *St. Lawrence River, *Turbidity, *Sediments, Salinity, *Estuaries, *Geochemistry, Water properties, Particulate matter.

A field study is presented of the variations in the elemental composition of suspended matter and sediment in the St. Lawrence river and estuary. Water samples were taken during May and November of 1976 at periods of high and low river discharge, respectively. Suspended particulate matter was sampled 635 times. An abrupt change in elemental composition was noted when traversing the front at the landward edge of the turbidity maximum. There appeared to be no relationship between salinity and elemental composition. The data collected clearly demonstrate the importance of estuaries in influencing the geochemistry of particulate matter accumulating and passing through. Among the important processes are diagenetic mobilization within the fine-grained sediments, early settling of the coarse-grained components and further size sorting within the turbidity maximum, and depletion of certain elements from the sediment and their export out of the estuary. (Baker-FRC)
W81-02822

ESTUARINE FISH COMMUNITIES OF THE EASTERN JAMES-HUDSON BAY COAST,
Laval Univ., Quebec. Centre d'Etudes Nordiques.
R. Morin, J. Dodson, and G. Power.
Environmental Biology of Fishes, Vol 5, No 2, p 135-141, April, 1980. 1 Fig, 5 Tab, 31 Ref.

Descriptors: *Estuaries, *Fish populations, *Hudson Bay, *James Bay, Canada, Saline water fish, Brackish water fish, Marine fish, Cold water fish, Fish types, Fish taxonomy, Fish barriers, Aquatic habitats, Distribution patterns.

Fish distribution was studied in 6 estuaries along 900 km and 7 degrees latitude on the east coast of James and Hudson Bays between 1973 and 1977. A total of 15 families and 38 species were found, 35 species in the estuaries and rivers of James Bay, the more southern water, and 24 in those of Hudson Bay. Freshwater species were reduced toward the north, euryhaline species being favored. Marine species, arctic and subarctic, accounted for less than a third of inshore fish, and were rare in estuaries of the southernmost water studied. Freshwater species may be less plentiful in the north because of the more rigorous climate, failure to penetrate beyond certain watersheds in the postglacial dispersion, and the limited distances to the first fish barrier in northern rivers. (Cassar-FRC)
W81-02834

NITROGEN AND PHOSPHORUS DISTRIBUTION AND UTILIZATION BY SPARTINA ALTERNIFLORA IN A LOUISIANA GULF COAST MARSH,
Louisiana State Univ., Baton Rouge. Lab. for Wetland Soils and Sediments.
R. J. Buresh, R. D. DeLaune, and W. H. Patrick, Jr.
Estuaries, Vol 3, No 2, p 111-121, June, 1980. 6 Fig, 2 Tab, 33 Ref.

Descriptors: *Nitrogen cycle, *Phosphorus compounds, *Salt marshes, Spartina alterniflora, Plant growth, Nutrients, *Louisana, *Estuaries, Water pollution effects, Path of pollutants, Nitrogen compounds, Phosphorus, Ammonium compounds, Wetlands, Coastal marshes, Marshes, Biomass, Soil chemical properties.

Nitrogen and phosphorus contents of Spartina alterniflora and soil nitrogen were studied along a 23 meter transect perpendicular to a stream in a Louisiana salt marsh. In June and September total N and P in plants were greater near the stream than at inland sites. Soil N varied from 0.43% 1.5 meters from the stream to 0.86% at 23 meters inland. Sediment N was 0.55%. Extractable ammonia-N levels in the sediment were 22.5 micrograms per gram (dry soil weight basis); 40-45 micrograms per gram 20 meters from the stream in the presence of sparse vegetation; and 4-7 micrograms per gram at 1.5 to 17 meters from the stream. Addition of labeled ammonia-N at 200 kg per hectare to an inland site increased biomass by 25-28% after four months. The ratio of below-ground plant material to above-ground plant material decreased from 5.7 to 4.7. Added phosphate-P did not significantly change plant height or biomass. About half the N in the above-ground portion of the plants was derived from added ammonia-N. After four months, 28-29% of added labeled N was recovered in the plant tissue, indicating that Spartina may serve as a sink for N entering the wetlands. Soil N was 99% organic, 1% inorganic, and not readily available to the plants. Above-ground plant tissue accounted for only 2% of the total N in the system (plants and soil to a depth of 20 cm), root systems 14%, and soil 84%. (Cassar-FRC)
W81-02840

RATE OF OCCURRENCE OF FALSE-POSITIVE RESULTS FROM TOTAL COLIFORM MOST-PROBABLE-NUMBER ANALYSIS OF SHELLFISH AND ESTUARIES,
Maryland Univ., College Park. Dept. of Microbiology.
D. Hussong, R. R. Colwell, and R. M. Weiner.
Applied and Environmental Microbiology, Vol 40, No 5, p 981-983, November, 1980. 1 Fig, 3 Tab, 15 Ref.

Descriptors: *Estuaries, *Bacterial analysis, *Most probable number test, *Shellfish, *Coliforms, Errors, Temperature, Oysters, Analysis of variance, *Chesapeake Bay.

Chesapeake Bay oysters and oyster beds were examined over a 2-year period to determine the rate of false-positive results from total coliform most-probable-number analysis of shellfish and estuaries. The sampling sites selected were commercially important oyster harvest areas, and the water column of both areas was subject to very little fecal contamination. Salinity and temperature of the water were measured, and a homogenized solution of oysters was prepared. A five-tube, total coliform MPN analysis of water, sediment, and oyster samples indicated that false-positive results were related to water temperature. In the past, total coliform MPN results for cold estuarine water samples were subject to high error. It is recommended that total coliform MPN evaluations of estuarine water, shellfish, and sediment samples include the complete test whenever the water temperature falls below 15 deg C. (Small-FRC)
W81-02847

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HIGH RECOVERY SEED SLURRY REVERSE OSMOSIS DEMONSTRATION FOR DESALTING WATERS SATURATED IN CALCIUM SULFATE.
Resources Conservation Co., Seattle, WA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193989, Price codes: A03 in paper copy, A01 in microfiche. Final Report, Prepared for Office of Water Research and Technology, February, 1981. 40 p, 17 Fig. OWRT-C-00040-D(No 0451)(1), 14-34-0001-0451.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, Tubular cellulose acetate membrane, Brackish water desalting, *Calcium sulfate removal, Roswell, New Mexico.

The purpose of this work was to demonstrate the technical feasibility of RCC's patented seeded slurry reverse osmosis process for desalting waters saturated in calcium sulfate. This was carried out by operating a portable seeded RO test unit at the OWRT test facility in Roswell, New Mexico. The field test was conducted in September and October of 1980. This unit was operated for a month at a recovery of 90% or more with no indication of scaling or fouling. It took a feed that was close to saturation with calcium sulfate and concentrated it by a factor of 10. The only pretreatment used was 25 micron filtration, acidification and chlorination. During the test the modules continuously saw a suspended solids level of 15,000 mg/l or more. This demonstrates a unique way of operating a reverse osmosis system and a process for achieving high recovery when operating on waters nearly saturated in slightly soluble salts, e.g., calcium sulfate and silica.
W81-02659

3C. Use Of Water Of Impaired Quality

EVALUATION OF THE IMPACT IMPOSED UPON SURFACE WATER SOURCES BY IMPLEMENTATION OF THE FEDERAL WATER CONSERVATION AND REUSE POLICY IN A RIVER BASIN WITH A WATER SURPLUS,
Eastern Tennessee State Univ., Johnson City. Dept. of Environmental Health.
C. S. Bishop, and R. R. Jacobs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193930, Price codes: A04 in paper copy, A01 in microfiche. University of Tennessee, Knoxville, Tennessee Water Resources Research Center, Research Report No 84, October, 1980. 41 p, 11 Tab, 5 Ref, 1 Append. OWRT-A-061-TENN(1), 14-34-0001-0145.

Descriptors: Federal jurisdiction, Surface water availability, *Water law, *Water quality, *Water reuse, *Water supply, Evaluation, *Model studies, Prediction, Legal aspects, Water quality standards, Water quality management, Potential water supply, Water management, Projections, Forecasting, Estimating, Surface water, Water use, Water conservation, Policy making, River basins, Baseline studies, Tennessee, Washington County.

This study was designed to determine baseline data on water quality in the Washington County, Tennessee section of the French Broad River Basin, and then project the consequences of three water conservation and reuse scenarios on water quality in a water surplus area: (1) no significant water conservation and reuse; (2) 10% water use voluntary reduction; (3) 30% reduction through a governmental program of incentives and regulatory restrictions. Sampling sites were selected to assess effects of non-point and point source inputs on water quality. The Nolichucky River and its tributaries appeared of good water quality; the River was not being used excessively as an industrial/domestic water resource or as a receiving water system for Washington County waste effluents. If the current water level usage continues, the Nolichucky will be able to absorb the negative influences on water quality without water conservation. Also, neither a voluntary 10% reduction nor a mandatory 30% reduction in water use will significantly alter the River water quality. (Zielinski-IPA)
W81-02654

EVALUATION OF INDUSTRIAL COOLING SYSTEMS USING RECLAIMED MUNICIPAL WASTE WATER, APPLICATION FOR POTENTIAL USERS,

Montgomery (James M.), Inc., Pasadena, CA.
R. R. Trussell, G. P. Treweek, K. P. Fox, P. H. Kreft, and G. J. Coulter.
California State Water Resources Control Board, Office of Water Recycling, Sacramento, Report November, 1980. 205 p, 33 Fig, 44 Tab, 39 Ref, 6 Append.

Descriptors: *California, *Waste water reclamation, *Water reclamation, *Water reuse, *Industrial water use, Water cooling, Municipal waste water, Industrial plants, Water use, Industrial water, Waste water treatment, Evaluation, Economic aspects, Cost analysis, *Impaired water use.

Among water-short regions of the country, waste water reclamation and reuse has become an increasingly important resource for meeting additional water needs. Industrial cooling water constitutes the third largest water-use category after agricultural irrigation and process water for manufacturing industries. This report describes the technical feasibility of additional industrial use of reclaimed waste water for cooling systems typically in use in southern California. Water shortages are predicted for southern California in the mid-to-late 1980s. Within the Los Angeles and Orange County areas alone, it is estimated that 96,000 acre-feet per year of municipal waste water could be used for industrial cooling. There is a gap between potential and existing applications in part because of uncertainty about the mechanics and costs of reuse for individual facilities. Several processes are available for treating reclaimed water. Each produces waste material that must be handled. Selection of the appropriate method depends on pretreatment water quality and the availability of adequate waste disposal facilities. Technical, institutional and cost components of industrial water reuse are described. The report analyzes existing reuse facilities and suggests guidelines for industries to use in evaluating their own potential for water reuse. The total annual costs of supply, transport and reuse of 3 million gallons per day(MGD) of reclaimed water for industrial cooling is approximately $1 million. It is suggested that public financing, perhaps as part of local or regional projects, would be appropriate to help fund such projects. (Garrison-Omniplan)
W81-02802

WASTEWATER EFFLUENTS FROM A TANNERY: THEIR EFFECTS ON SOIL AND VEGETATION IN PAKISTAN,
University of the Punjab., Lahore (Pakistan). Dept. of Botany.
K. H. Sheikh, and M. Irshad.
Environmental Conservation, Vol 7, No 4, p 319-324, Winter, 1980. 2 Fig, 4 Tab, 10 Ref.

Descriptors: *Tannery wastes, Saline soils, *Agriculture, Irrigation, *Imparied water use, Soil properties, Land reclamation, Chlorides, Water pollution effects, Sodium, Salinity, Pollutants, Crops, Industrial wastes, Salts, *Wastewater disposal, Reclamation, Ultimate disposal, Disposal, Water quality, *Pakistan.

Highly saline, greenish-blue tannery waste water effluents, which averaged 106.59 milliequivalents per liter Na, 93.3 meq chloride, and 14,000 micromhos per cm electrical conductivity, were used to irrigate crops in fields adjacent to the Firdaus tannery at Muridke, Pakistan. Although rice and mustard seeds did not germinate in soil watered with the pure effluent, they showed 79-80% germination in 3:1 dilution (distilled water:waste water). Farmers generally supplement the small volume of waste water with tube well irrigation. The fields, which were wasteland before tannery operation began, had significantly greater moisture content, water-stable aggregates, water-holding and cation-exchange capacities, quantity of organic matter, and exchangeable Na than a plot of adjacent wasteland. The cropland also had lower electrical conductivity, pH, concentrations of Ca, Mg, soluble Na, chlorides and sulfates, sodium adsorption ratio, and exchangeable Na than the wasteland. Therefore, application of tannery effluent to a very highly saline and sodic wasteland soil improved soil characteristics so that agriculture was eventually possible. However, use on normal soil is likely to create salinity problems. (Cassar-FRC)
W81-02897

3F. Conservation In Agriculture

WASTE WATER SPRAY TRANSPORT IN LAND APPLICATION,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
N. J. Zimmerman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-170540, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1980. 246 p, 23 Fig, 24 Tab, 92 Ref, 8 Append. OWRT-B-104-NC(3).

Descriptors: *Waste water irrigation, *Irrigation, *Spray irrigation, Water use, Aerosols, *Pathogenic bacteria, Microorganisms, Bacteria, *Waste water disposal, Waste water farming, Waste water outfall, Direct irrigation, Land disposal, Spraying, Sprays, Pollution load, Water pollution sources, Pollutants, Bioindicators, Pollutant identification, Fallout, Pathogens.

A small portion of wastewater sprayed in a land irrigation or disposal system will be aerosolized, making possible airborne transport of pathogenic microorganisms. Two spray solutions (one containing Escherichia coli coliform bacteria; the other, a fluorescent dye, uranine) were simultaneously sprayed in an open field to simulate the aerosolized portion of a full-scale irrigation spray. Ambient concentrations were determined up to 300 meters downwind; maximum downwind concentrations being estimated from dye field data for 65 experimental runs. These data plus meteorological data (e.g., solar radiation, relative humidity, temperature, wind speed/direction) were analyzed to develop an appropriate atmospheric dispersion model. Linear regression analysis of all daytime runs gave an empirical model that predicted concentrations for 84% of the data within a factor of two. A bacterial airborne viability model indicated that logarithm bacterial death rate correlated inversely with relative humidity and directly to solar radiation. Evaluation of the overall study indicated low levels of pathogens (about one per cubic meter, 30 meters downwind from spraying). Dose-response infectivity and disease studies are needed to further assess health hazard potential. (Zielinski-IPA)
W81-02722

USE OF CROP CANOPY-AIR TEMPERATURE DIFFERENCE FOR IRRIGATION SCHEDULING,
Minnesota Univ., Minneapolis.
K. M. Geiser, E. R. Allred, and D. C. Slack.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198426, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, March, 1981. University of Minnesota Agricultural Engineering Report Series. 49 p, 4 Fig, 5 Tab, 27 Ref, 5 Append. OWRT-A-037-MINN(2), 14-34-001-0125.

Descriptors: *Irrigation efficiency, Irrigation requirements, *Air temperature, *Crop production, *Corn, *Scheduling, *Multivariate analysis, Irrigation, Irrigation engineering, Irrigation practices, Irrigation programs, Irrigation water, Temperature effects, Temperature, Thermal stress, Water stress, Crop yield, Canopy, Prediction, Regression analysis, Thermometers.

The difference in temperature (DT) between the crop canopy and the air enables an infrared thermometer to be used as a scheduling tool. As water becomes limiting, the crop temperature increases due to the lack of water for cooling by transpiration. The study objectives included development of a model for DT to schedule irrigations, testing the DT model by using it for corn irrigation scheduling in central Minnesota, and evaluating the model by comparison to unirrigated corn (and corn using irrigation scheduling by electric resistance blocks and an evaportranspiration model). Analysis of data (net radiation, wind speed, relative humidity, wet/dry bulb temperatures, available soil moisture and DT) collected over two corn growing seasons, (1978 and 1979 summers) indicated that DT was primarily dependent on net radiation. Multiple linear regression analysis gave an equation expressing DT as a function of available soil water, relative humidity and net radiation, which was used to determine critical temperature differences for initiating corn irrigation during the 1980 growing season. The method compared favorably with other more common irrigation scheduling methods, and indicated reduced water use without significant crop yield reductions. (Zielinski-IPA)
W81-02724

IRRIGATION OF CROPS IN THE SOUTHEASTERN UNITED STATES, PRINCIPLES AND PRACTICE,
Southern Piedmont Conservation Research Center, Watkinsville, GA.
R. R. Bruce, J. L. Chesness, T. C. Keisling, J. E. Pallas, Jr., and D. A. Smittle.
Agricultural Reviews and Manuals ARM-S-9, May 1980. 60 p, 26 Fig, 25 Tab, 59 Ref.

Descriptors: *Irrigation practices, *Soil-water-plant relationships, *Crop production, Plant growth, Farm management, Climates, Fertilizers, Water deficit, Drought, Irrigation requirements, Humid areas, Soil temperature, Soil properties, Drought resistance, Plant physiology, Southeast U.S.

Although the basic relationships of plant growth, soil, and water are applicable in any climate and geographic region, the application of basic principles to particular plant-soil-water systems presents unique problems. The practices associated with irrigated agriculture in arid regions are not appropriate in a humid region like the southeast, where excess water can be as frequent a problem as a water deficit. The primary region of application of this review has soils chiefly classified as Udalfs and Udults existing in the udic water regime and thermic temperature regime. The region has more than 40 inches of mean annual precipitation, with less than 5 inches of absolute water deficit, and a mean annual soil temperature at the 20 inch depth between 59 and 72 degrees F. Most aspects of crop management are discussed in the context of irrigation practice to achieve high yields in this climate and these soils. Variations in drought tolerance among crop species and among cultivars may determine the water regime required for acceptable crop performance. The sensitivity of many crops to drought varies greatly with physiological growth stage. For typical crop, soil, and climate situations, procedures are outlined for selecting irrigation equipment and for operating the equipment to provide the dependable soil-water control necessary for meeting a crop's water needs. In this region, the managing of mobile nutrients deserves particular attention. Since nutrients can easily be applied through the commonly used irrigation systems, crop requirements can be programmed and met simultaneously with water requirements. (Moore-SRC)
W81-02780

APPLICATION OF WIND ENERGY TO GREAT PLAINS IRRIGATION PUMPING,
Science and Education Administration, Manhattan, KS. North Central Region.
For primary bibliographic entry see Field 8C.
W81-02781

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

BAYES-MARKOV ANALYSIS FOR RAIN-CATCHMENT CISTERNS,
Hawaii Univ., Honolulu. Water Resources Research Center.
Y-S. Fok, R. H. L. Fong, J. Hung, E. T.

Murabayashi, and A. Lo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193963, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No 133, March, 1980. 100 p, 26 Fig, 5 Tab. OWRT-A-073-HI(3), 14-34-0001-8013, 9013.

Descriptors: *Cisterns, *Rainfall, *Water demand, *Storage capacity, *Water management(Applied), *Dynamic programming, Water conservation, Droughts, *Hawaii, Water storage, *Bayes-Markov analysis, Rainfall probabilities, Risk analysis, Design methodology, Operational methodology, Pauoa Flats rain gage, Oahu.

In many parts of the world, public water-supply systems have shown signs of an inability to adequately service increasing demand. As a result, water shortages have occurred and moratoriums on new development areas have been imposed. And because of recurrent droughts and the rapid acceleration of urban development in recent years, the rain-catchment system and its cost effectiveness are now regaining the attention of researchers and planners as a 'new' and important alternative water supply. Rainfall, catchment area, storage capacity of the cistern, and water demand are the four main elements considered in the design, operation and management of a cistern system. Expected weekly rainfall is the main uncontrollable element of concern to the cistern owner; therefore, to meet this problem, expected weekly rainfall probabilities were first simulated by the Bayesian analysis. Then the sequential property contained in the 25-yr rainfall record was utilized to generate the likelihood probability function by using the lag 1 Markov sequential analysis. The Bayes-Markov analysis was subsequently applied to obtain the weekly rainfall probabilities. As a result of these analyses, the Bayes-Markov probabilistic approach for weekly rainfall simulation has shown its usefulness. Design and operational methodologies are also presented in the report.
W81-02657

EFFECTS OF THE PROPOSED PROSPERITY RESERVOIR ON GROUND WATER AND WATER QUALITY IN LOWER CENTER CREEK BASIN, MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W81-02678

EFFECTS OF THE RATE OF RELEASES FROM SAM RAYBURN RESERVOIR ON THE AERATION CAPACITY OF THE ANGELINA RIVER, EASTERN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
J. Rawson, R. L. Goss, and I. G. Rathbun.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A094 303, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-58, July, 1980. 23 p, 4 Fig, 5 Tab, 3 Ref.

Descriptors: *Reservoir releases, *Aeration, *Water quality, *Dissolved oxygen, *Texas, Streamflow, Flow rates, Reservoir operation, Data collections, Sites, *Sam Rayburn Reservoir, Angelina River, Time of travel.

A three-phase study was conducted during July and August 1979 to determine the effects of varying release rates through the power-outlet works at Sam Rayburn Reservoir, eastern Texas, on aeration capacity of a 14-mile reach of the Angelina River below Sam Rayburn Dam. The dominant factors that affected the aeration capacity during the study time were time of travel and the dissolved-oxygen deficit of the releases. Aeration was low throughout the study but increased in response to increases in the dissolved-oxygen deficit and the duration of time that the releases were exposed to the atmosphere (time of travel). The average concentration of dissolved oxygen sustained by release of 8,800 cubic feet per second decreased from 5.0 milligrams per liter at a site near the power outlet to 4.8 milligrams per liter at a site about 14 miles downstream; the time of travel averaged about 8 hours. The average concentration of dissolved oxygen in flow sustained by releases of 2,200 cubic feet per second increased from 5.2 to 5.5 milligrams per liter; the time of travel averaged about 20 hours. (USGS)
W81-02686

PROCEEDINGS OF THE WORKSHOP ON AQUATIC WEEDS: CONTROL AND ITS ENVIRONMENTAL CONSEQUENCES, ENVIRONMENTAL PROTECTION AGENCY, ENVIRONMENTAL RESEARCH LABORATORY, GULF BREEZE, FLORIDA, FEBRUARY 25-26, 1980.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-181190, Price codes: A02 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/9-81-010, Walsh, G. E., Ed., February 1981. 28 p, 1 Fig, 2 Tab, 15 Ref.

Descriptors: *Aquatic weed control, *Environmental effects, *Chemcontrol, *Biocontrol, *Mechanical control, Integrated control measures, Herbicides, Ecosystems, Insects, Fish, Pathogens, Controlled release pesticides, Costs.

Participants at the workshop reviewed the state-of-the-art of chemical, biological, mechanical, and integrated control of aquatic weeds, and discussed problems and how the EPA can assist in working toward their solutions. For each control method the method is reviewed by the group leader and followed by an outline of important points and recommendations by the participants. Chemical control is the dominant control method but information is needed in five areas: an inventory of weed problems; lack of basic data on aquatic weeds; maintenance level for aquatic weeds; effectiveness and safety of 2,4-D; and controlled-release formulations. Biological controls have shown some success. Research is needed in the areas of host specificity, cost, and potential for altering ecosystems when insects are the controlling organisms; lack of information on plant pathogens, cost of their production, and necessity of repeated treatments when plant pathogens are used; and the use of grass carp and hybrid carp when fish are the controlling organisms. The cost of harvesting and disposal of weeds after mechanical control is often prohibitive, but the method allows rapid removal of plants. Problem areas include: effects on dispersal of weeds; time of harvesting; concepts of aquatic plant control and aquatic plant management; disposal of harvested weeds; harvesting of weeds as a method of nutrient removal; and utilization of harvested weeds. Integrated control, using two or more of the above methods can achieve more precise vegetation management. Possible combinations include: herbicide treatment followed by stocking with fish, or pathogen application; mechanical harvesting followed by fish or pathogens; treatment with insects followed by pathogens; and mechanical or chemical control followed by competitive plants. (Brambley-SRC)
W81-02787

4B. Groundwater Management

EVALUATING METHODS FOR DETERMINING WATER USE IN THE HIGH PLAINS IN PARTS OF COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING; 1979,
Geological Survey, Denver, CO. Water Resources Div.
F. J. Heimes, and R. R. Luckey.
Geological Survey Water-Resources Investigations 80-111, 1980. 118 p, 9 Fig, 15 Tab, 6 Ref.

Descriptors: *Groundwater resources, *Water use, Water utilization, *Aquifer management, *Irrigation, Pumping, Discharge measurement, Instrumentation, Regional analysis, Analytical techniques, Mapping, Aerial photography, Remote sensing, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, Wyoming, *High Plains aquifer.

The volume and areal distribution of ground-water withdrawals (pumpage) for irrigation during 1980 are required for the High Plains Regional Aquifer-System Analysis. In 1979, approaches and instrumentation that might be suitable for application to 1980 water-use determinations were tested. Pumpage was sampled by monitoring time of operation and discharge of irrigation wells during the growing season. The total volume pumped during the irrigation season was compared to the crop type and acreage irrigated. This comparison provided a means of extending sampled pumpage information to unmonitored areas using irrigated cropland maps. A transient-time flowmeter and a vibration-sensitive timing device proved to be reliable in providing discharge and time of operation information, respectively. Statistical analysis of comparisons between pumpage and irrigated cropland indicated that significant differences existed in the amounts of water applied between flood and sprinkler irrigation systems. However, statistical analyses of differences in amounts of water applied for different crop types and for selected climatic factors were inconclusive. A variety of approaches were tested to develop the irrigated cropland maps needed to extend sampled pumpage data. Of the methods tested, only Landsat data proved to be effective for application to an area as large as the High Plains. The results obtained in the 1979 evaluation of instrumentation and pumpage sampling approaches have been used to formulate a strategy for monitoring irrigation water use in the High Plains in 1980. (USGS)
W81-02691

EFFECTS OF ARTIFICIAL-RECHARGE EXPERIMENTS AT SHIP CREEK ALLUVIAL FAN ON WATER LEVELS AT SPRING ACRES SUBDIVISION, ANCHORAGE, ALASKA,
Geological Survey, Tacoma, WA. Water Resources Div.
W. Meyer, and L. Patrick.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $5.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1284, 1980. 42 p, 22 Fig, 2 Tab, 4 Ref.

Descriptors: *Artificial recharge, *Water levels, *Groundwater, *Model studies, *Land use, Aquifer characteristics, Groundwater movement, Observation wells, Water level fluctuations, Forecasting, Hydrogeology, Hydrographs, Alaska, *Anchorage.

The effect of the artificial recharge experiments on water levels at Spring Acres subdivision, Anchorage, Alaska, was evaluated using two digital models constructed to simulate groundwater movement and water-level rises induced by the artificial recharge. The models predicted that the artificial recharge would have caused water levels in the aquifer immediately underlying Spring Acres subdivision to rise 0.2 foot from May 20 to August 7, 1975. The models also predicted a total rise in groundwater levels of 1.1 feet at this location from July 16, 1973 to August 7, 1975, as a result of the artificial-recharge experiments. Water-level data collected from auger holes in March 1975 by a consulting firm for the contractor indicated a depth to water of 6-7 feet below land surface at Spring Acres subdivision at this time. Water levels measured in and near Spring Acres subdivision several years before and after the 1973-75 artificial-recharge experiments showed seasonal rises of 2 to 12.4 feet. A depth to water below land surface of 2.6 feet was measured 600 feet from the subdivision in 1971 and in the subdivision in 1977. Average measured depth to water in the area was 7.0 feet from early 1976 to September 1979. (USGS)
W81-02696

STUDY PLAN FOR THE REGIONAL AQUIFER-SYSTEM ANALYSIS OF ALLUVIAL BASINS IN SOUTH-CENTRAL ARIZONA AND ADJACENT STATES,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 6A.
W81-02701

ASSESSMENT OF PUBLIC GROUNDWATER SUPPLIES IN ILLINOIS,

Illinois State Water Survey, Urbana.
A. P. Visocky, H. A. Wehrmann, and K. W. Kim.
Circular 144, 1980. 74 p, 2 Fig, 1 Tab, 2 Ref, Append.

Descriptors: *Illinois, *Aquifer characteristics, *Groundwater management, Groundwater depletion, *Aquifer testing, Aquifer management, Aquifers, Well yield, Observation wells, Groundwater reservoirs, Groundwater storage, Bedrock, Glacial drift, *Groundwater availability.

This report summarizes available information regarding the current status of public groundwater supplies in Illinois, excluding the six northeastern counties. Data on each public groundwater supply were reviewed, and supplies were assessed as adequate, marginal, or deficient, in terms of present demands. The study indicated that thirty-nine supplies were marginal for current use and four were deficient. The majority of the marginal and deficient supplies are located in the central third of the state, where most of the other supplies are also located. The 677 public groundwater supplies outside northeastern Illinois have an estimated daily pumpage of 233 million gallons. Among the individual counties, Winnebago County had the highest daily pumpage, with 43.1 mgd. The largest individual supply is the city of Rockford, which pumps an average of 37 mgd. The largest supplies were generally obtained from major alluvial or bedrock valley deposits. Thirty counties were found to have one or more supplies that are less than adequate. This report is part of a three-part plan to study and test water resources and determine alternatives where necessary. (Garrison-Omniplan)
W81-02794

ADEQUACY AND ECONOMICS OF WATER SUPPLY IN NORTHEASTERN ILLINOIS: PROPOSED GROUNDWATER AND REGIONAL SURFACE WATER SYSTEMS, 1985-2010,
Illinois State Water Survey, Urbana.
K. P. Singh, and J. R. Adams.
Report, May 1980. 200 p, 47 Fig, 68 Tab, 39 Ref, Append.

Descriptors: *Illinois, *Groundwater resources, Well yield, *Economic aspects, *Groundwater availability, Costs, Municipal water, Economic yield, Well data, Cost analysis, *Water supply development, Cost-benefit ratio, River systems, Aquifer management, Radium radioisotopes, Groundwater management.

The purpose of this three-year cooperative effort between the State Water Survey and the Division of Water Resources was to plan for the optimal use of water resources in northeastern Illinois and to ensure that all towns in Cook, Du Page, Kane, Lake, McHenry, and Will Counties will have an adequate and dependable water supply up to the year 2010. This area has a population of about seven million and a land area of 3,714 square miles; municipal and industrial water supplies are presently obtained either from Lake Michigan or from groundwater. Future water demands were projected using the appropriate equation with a multiplier to account for each town's variation from the average regression equation. Cost functions, in terms of July 1980 dollars, were developed for wells, well pumps, reservoirs, water treatment, pipelines, and pipeline pumping stations. The optimal systems and their projected demands for 2010 were found to be: Lake County system supplying 17 towns, 27.80 mgd; Southern Cook County system supplying 8 towns, 19.98 mgd; Du Page County system supplying 19 towns, 77.55 mgd; Northwestern Cook County, 14 towns, 61.59 mgd; Fox River system, 8 towns, 35.61 mgd; and Kankakee River system, 10 towns, 25.33. Except for the Fox River system, conjunctive use is not economical. (Garrison-Omniplan)
W81-02795

4D. Watershed Protection

CONSERVATION TILLAGE: BEST MANAGEMENT PRACTICE FOR NONPOINT RUNOFF,
Wisconsin Univ.-Madison. Dept. of Soil Science.
D. H. Mueller, T. C. Daniel, and R. C. Wendt.
Environmental Management, Vol 5, No 1, p 33-53, January, 1981. 8 Fig, 8 Tab, 70 Ref.

Descriptors: *Soil conservation, *Erosion control, *Cultivation, Soil management, Contour farming, Erosion, Furrows, Soil erosion, Water pollution sources, Conservation tillage.

Conservation tillage, alone or in combination with other conservation practices, is an effective method for solving serious water erosion problems. It may also be useful in controlling wind erosion in dry areas. Conservation tillage is any tillage system that reduces the loss of soil and/or water when compared to unridged or clean tillage. Disking and no-till planting are two such systems. Conservation tillage practices can produce yields equal to or better than conventional techniques, and less phosphorus is lost from the land. No-till and contoured chisel plowing can reduce soil loss by approximately 90%, while other methods may reduce soil loss by 50%. Total phosphorus losses are reduced, but there have been no studies on the effects of this on aquatic life. There may be lower sediment phosphorus loss but higher available phosphorus loss. It is also unclear if pesticide losses are reduced. (Small-FRC)
W81-02818

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SURVEY AND CONTROL OF SYNTHETIC ORGANICS IN TEXAS WATER SUPPLIES,
Texas A and M Univ., College Station. Water Resources Inst.
B. Batchelor, J. D. Shannon, and P-d. Yang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198384, Price codes: A08 in paper copy, A01 in microfiche. Technical Report 109, January, 1981. 155 p, 41 Fig, 5 Tab, 136 Ref, 3 Append. OWRT-A-047-TEX(1), 14-34-0001-9046, 14-34-0001-0146.

Descriptors: *Texas, *Water quality control, *Chlorinated hydrocarbons, Chlorination, *Water treatment, Coagulation, Turbidity, Synthesis, Lakes, Rivers, Chlorine, Halogens, Residual chlorine, Waste water treatment, Organic compounds, Water analysis, Trace levels, Toxins, Chemical treatment, Waste water oxidation, Oxidation process.

The primary objective was to evaluate the significance of synthetic compounds produced during treatment in selected water supplies and to study the effectiveness of conventional/nonconventional treatment technology for their control. Four Texas water supplies (Lakes Somerville and Livingston, and the Neches and Sabine Rivers) were surveyed to determine their tendency to form trihalomethanes (THM) when chlorinated. Conventional alum coagulation (CAC) was studied in a series of jar tests; effect of pH and alum dose was determined for removal of THM formation potential (THMFP), uv-absorbance, total organic carbon, and visible-absorbance. The latter was used as a surrogate for turbidity. Modification of CAC (addition of acid or base, or of secondary coagulants) was studied; a medium molecular weight cationic polymer and activated silica were used with alum and as sole coagulants. An innovative treatment process for removal of THMFP was also investigated. Batch and continuous flow systems using activated alumina adsorption significantly removed organics, uv-absorbance and THMFP from drinking water. (Zielinski-IPA)
W81-02719

DEVELOPMENT OF METHODS FOR THE DETECTION OF TRACE AMOUNTS OF SELECTED CARCINOGENIC AND MUTAGENIC AMINES IN WATER,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
J. C. Means, E. G. Perkins, D. Ellis, and M. M. Chaudry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198350, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, February, 1981. Illinois Water Resources Center, University of Illinois Research Report 156. 51 p, 16 Fig, 12 Tab, 49 Ref. OWRT-B-107-ILL(1), 14-34-0001-8081.

Descriptors: Technology, *Detection limits, *Trace levels, *Nitrogen compounds, *Water pollution, *Carcinogens, Chromatography, Technology transfer, Organic compounds, Organic loading, Gas chromatography, Gas liquid chromatography, Separation, Techniques, Sampling, Sample preparation, Water sampling, Water quality measurement, Stream pollution, Hazardous materials, Toxins.

Efforts were focused on the development of analytical schemes for reliable detection, separation, and quantification of trace levels of a number of aromatic and heterocyclic amines using both liquid (HPLC) and gas (GLC) chromatography. Field evaluations of the final methods were carried out and reported. It was found that GLC with flame-ionization and nitrogen-specific detection can successfully be used for analysis of amine mixtures of wide volatility using fairly non-polar columns (e.g., OV-17; Tenax GC). Some high-volatility amines appear lost during extraction/concentration; thus, XAD resin columns may be superior for amine concentration and also eliminate tedious extraction steps that affect amine recoveries. Use of river water as a matrix showed that some amines bind to biological and/or inorganic particulate matter present; procedures are needed to account for such bound residues. HPLC (UV/fluorescence detection) successfully analyzed the amine mixtures also, using acetonitrile gradients in water and reverse-phase C-18 columns. HPLC may offer some advantages in analyzing thermally-labile amines or polar metabolities of amines. (Zielinski-IPA)
W81-02721

GC/MS METHODOLOGY FOR MEASURING PRIORITY ORGANICS IN MUNICIPAL WASTE WATER TREATMENT,
Cincinnati, OH. Municipal Environmental Research Lab.
D. F. Bishop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-127813, Price codes: A02 in paper copy, A01 in microfiche. Project Summary EPA-600/S2-80-196, December, 1980. 5 p, 2 Fig, 1 Tab, 9 Ref.

Descriptors: *Mass spectrometry, *Gas chromatography, *Organic compounds, *Municipal waste water, Sludge, Pollutants, *Waste water analysis, Pollutant identification, Waste water treatment.

An EPA-developed methodology for measuring priority toxic organics in municipal waste waters and sludges is based on gas chromatography/mass spectrometry (GC/MS) technology. The methodology separates the purgeable priority organics from the sample by purging with inert gas and trapping the organics on a Tenax and silica gel trap. The organics are then desorbed, identified, and quantitated with packed column GC/MS analysis. The extractable organics are separated by extracting with methylene chloride, first at pH 11 and then at pH 2. The organics in the two extracts are identified and quantitated by packed column GC/MS analysis. The basic methodology analyzes the purgeable organics in municipal wastewaters satisfactorily but requires one modification in the equipment. By substituting charcoal for the silica gel in the trap, all of the purgeable priority organics are identified and satisfactorily quantified. In the basic methodology for extractable organics, a few of the organics are not measured well. Extracts may require clean-up or organic separation before GC/MS analysis. Principal classes of organic interferences include lipids, fatty acids, and saturated hydrocarbons. The approaches to separate the desirable priority organics from the interferences include acid-base separation, molecular size separation, and polarity separation. (Moore-SRC)

W81-02784

DETERMINATION OF LEAD IN DRINKING WATER BY ATOMIC ABSORPTION SPECTROPHOTOMETRY WITH ELECTROTHERMAL ATOMISATION,
Severn-Trent Water Authority, Nottingham (England). Regional Lab.
M. P. Bertenshaw, D. Gelsthorpe, and K. C. Wheatstone.
Analyst, Vol 106, No 1258, p 23-31, January, 1981. 1 Fig, 8 Tab, 15 Ref.

Descriptors: *Lead, Water analysis, Lanthanum, Spectrometry, Analytical techniques, *Pollutant identification, *Drinking water, *Atomic absorption spectrophotometry.

Determination of lead in water by electrothermal atomization was improved by pretreatment with lanthanum, either by addition of lanthanum chloride to the sample or preferably, by impregnation of the furnace tube. Samples pretreated with lanthanum chloride were given 0.1% mass/volume for manual injection and 0.01% mass/volume for automated injection. Impregnation of furnace tubes was done by immersing the tubes in a concentrated solution of lanthanum nitrate and leaving in a vacuum desiccator until the solution had been absorbed. Limit of detection was less than 1.0 microgram per liter, total standard deviation less than 1.5 micrograms per liter or 5% of the concentration, and bias less than 5 micrograms per liter or 10% of the concentration over a range of 0-100 micrograms per liter. (Cassar-FRC)
W81-02811

SCANNING ELECTRON MICROSCOPE EVIDENCE FOR BACTERIAL COLONIZATION OF A DRINKING-WATER DISTRIBUTION SYSTEM,
California Univ., Irvine. Div. of Environmental Analysis.
H. F. Ridgway, and B. H. Olson.
Applied and Environmental Microbiology, Vol 41, No 1, p 274-287, January, 1981. 14 Fig, 26 Ref.

Descriptors: *Iron bacteria, *Bacteria, *Distribution systems, Pipes, Water supply systems, Microorganisms, Corrosion, *Pollutant identification, Gallionella, Potable water.

The nature and characteristics of microorganisms on the surfaces of a water distribution main in service for 25 years and in particulate matter in fire hydrant water and well water were examined by scanning electron microscope. The bacteria-like structures and microcolonies, sparsely and randomly distributed along the pipe surfaces, included chain-forming cocci, filamentous types (most frequently observed), prosthecate types (usually found in oligotrophic environments), and Gallionella, an iron-oxidizing bacterium with typical spiral stalks. The surfaces of suspended particles contained large numbers of rod-shaped bacteria. Major elements detected by X-ray energy scans of the pipe surface were Si, P, S, Ca, and Fe. Minor amounts of Zn, Mg, Al, K, and Mn were also seen. These microorganisms could be responsible for taste, odor, or color problems in water systems. In addition, the bacteria count may be underestimated. Extensive aggregation of cells and the building of slime layers may reduce the effectiveness of disinfection methods and encourage further pipe fouling and corrosion. (Cassar-FRC)
W81-02812

INCIDENCE OF PLASMIDS IN MARINE VIBRIO SPP. ISOLATED FROM AN OIL FIELD IN THE NORTHWESTERN GULF OF MEXICO,
Houston Univ., TX.
H. S. Hada, and R. K. Sizemore.
Applied and Environmental Microbiology, Vol 41, No 1, p 199-202, January, 1981. 1 Fig, 2 Tab, 22 Ref.

Descriptors: *Plasmids, *Bacteria, *Marine bacteria, *Oil pollution, Aquatic bacteria, Water pollution effects, Bioindicators, Vibrio, Microbiology, *Gulf of Mexico.

Vibrio spp. were collected from an operating oil field 50 km south-southeast of Galveston, Texas, in the Gulf of Mexico and examined for the presence of plasmids, extrachromosomal deoxyribonucleic acid elements. The oil field Vibrio spp. samples had 35% plasmid-containing samples with an average of 2.5 (range 2-7) plasmids each; the control site, 23%, with an average of 1.5 plasmids each. Over half the plasmids were in the size range 0-12 Megadaltons, a substantial number were in the 10-80 Mdal range, very few greater than 80, and none over 100. Low level chronic pollution from hydrocarbons and sulfur is believed to be the cause of these changes. (Cassar-FRC)
W81-02813

THE STATISTICAL DISTRIBUTION OF SEWAGE AND SLUDGE ANALYSES,
Oxford Univ. (England), Dept. of Agricultural Science.
P. H. T. Beckett.
Environmental Pollution (Series B), Vol 1, No 1, p 27-35, January, 1980. 5 Fig, 1 Tab, 6 Ref.

Descriptors: *Sewage sludge, *Sludge disposal, *Statistical methods, Sampling, Analysis, Heavy metals, Metals, Copper, Nickel, Zinc, Cadmium, Lead, Chromium, Pollutant identification, Path of pollutants, Sewage, Agriculture, Soil amendments, Disposal, *Great Britain.

Heavy metals were determined in successive samples of raw sewage and digested sewage sludge from a medium-sized sewage works in Great Britain over the period August-December 1973. Cu, Ni, Zn, Cd, Pb, and Cr concentrations in finished sludge were log normally distributed about their central value. However, raw sewage analyses showed marked skewness to high values, with Cu, Zn, and Cd also showing minor low peaks. This variability may have been caused by dilution at the source or reduction in industrial production during holidays and weekends. Cu levels were highest on Tuesday through Thursday; Zn, Cd, Pb, and Cr, highest on Thursday; and Ni, highest on Thursday through Sunday. All metal levels were reduced by half or more during Christmas week. Rainfall had very little effect on metal concentrations. An understanding of these distributions is essential when sludge is applied on agricultural land. (Cassar-FRC)
W81-02817

MEASUREMENT OF PHYSIOLOGICAL CONDITION OF MUSSELS TRANSPLANTED ALONG A POLLUTION GRADIENT IN NARRAGANSETT BAY,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5C.
W81-02819

AN ION-EXCHANGE TECHNIQUE FOR CONCENTRATING AMMONIA FROM SMALL VOLUMES OF SEAWATER,
Oregon State Univ., Corvallis. Dept. of General Science.
R. T. Riley, and M. C. Mix.
Marine Chemistry, Vol 10, No 2, p 159-164, 1981. 3 Fig, 1 Tab, 7 Ref.

Descriptors: *Ammonia, *Analytical techniques, Nitrogen, *Ion exchange, *Seawater, Water quality control.

A very sensitive method is described for the determination of ammonia in seawater. The method is suitable where the size of the seawater sample is limited due to experimental design. The method involves an ion-exchange concentration technique using the phenol-hypochlorite reaction for assaying the ammonia concentration in the ion-exchange column eluate. It has been used for seawater samples of 5 and 10 ml and can be scaled down for use with 1.0 ml samples. The method is based in part on the batch ion-exchange procedure for plasma ammonia as previously described. As an example of the method a 10 ml seawater sample was analyzed with ammonia concentrations established at 10 to 150 microgram/l. (Baker-FRC)
W81-02823

ISOLATION OF DISSOLVED ORGANIC MATTER AND COPPER-ORGANIC COMPLEXES FROM ESTUARINE WATERS USING REVERSE-PHASE LIQUID CHROMATOGRAPHY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. L. Mills, and J. G. Quinn.
Marine Chemistry, Vol 10, No 2, p 93-102, 1981. 1 Fig, 2 Tab, 21 Ref.

Descriptors: Sea water, *Chromatography, *Organic matter, *Copper, *Estuaries, *Narragansett Bay, Rhode Island, Analytical techniques.

Preliminary results on the use of reverse-phase liquid chromatography (RPLC) in the study of marine dissolved organic matter (DOM), with particular emphasis on copper-organic complexes in estuarine waters, are reported. Seawater samples were collected from various salinity mixing regimes ranging from the Providence River in the upper Narragansett Bay, Rhode Island to the lower bay. The procedure succeeded in isolating 10-30% of the organic matter and up to 50% of the total dissolved copper from various bay samples. Chromatograms were obtained using high performance liquid chromatography of the isolated organic matter. Qualitative differences were noted in the organic matter content between sampling stations. (Baker-FRC)
W81-02824

CHROMATOGRAPHIC ENRICHMENT OF ACIDIC COMPOUNDS FROM ORGANIC SOLVENTS USING ALKALI METAL SILICATES,
Columbia National Fisheries Research Lab., MO.
D. L. Stalling, J. D. Petty, and L. M. Smith.
Journal of Chromatographic Science, Vol 19, No 1, p 18-26, January, 1981. 7 Fig, 2 Tab, 25 Ref.

Descriptors: *Chromatography, *Acids, *Phenols, Silicates, Alkali metals, Pollutant identification, Analytical techniques, Adsorption, Silica, Cesium, Potassium, Sodium, Lithium, Organic compounds, Pesticide residues, Herbicides.

Alkali metal (Li, Na, K, and Cs) hydroxide-treated silica gels were evaluated for their ability to retain, separate, and enrich trace residues of acidic components, especially substituted phenols. The method is applicable to determination of residues (including 2,4-D, picloram, and sulfa drugs) in tissues, soil, and water. Retention of acid compounds increased with increasing ionic radius of the alkali metal. Cs silicate was clearly superior for retention of sterically-hindered phenols such as 2,4,6-trimethylphenol, but BHT, 2,6-ditertiarybutyl-4-methyl phenol, did not react with any silica gel tried. Samples were applied to columns 1.0 x 8.5 cm in methylene chloride/cyclohexane 1:1 by volume and eluted with this solvent or 0 to 50% methanol mixed with this solvent. (Cassar-FRC)
W81-02829

INCIDENCE OF MARINE BDELLOVIBRIOS LYTIC AGAINST VIBRIO PARAHAEMOLYTICUS IN CHESAPEAKE BAY,
Maryland Univ., Baltimore. Dept. of Microbiology.
H. N. Williams, W. A. Falkler, Jr., and D. E. Shay.
Applied and Enviromental Microbiology, Vol 40, No 5, p 970-972, November, 1980. 2 Tab, 8 Ref.

Descriptors: *Estuaries, *Marine bacteria, *Bacterial analysis, Water sampling, Water properties, Water quality data, *Chesapeake Bay.

A study of the distribution of bdellovibrios lytic against Vibrio parahaemolyticus was undertaken in the Chesapeake Bay by collecting water samples at nine sites. The environmental parameters of each sample were determined. Examination of randomly selected plaques by phase and electron microscopy demonstrated the presence of curved, rod-shaped bacteria measuring approximately 0.3 microns in width and 10 microns in length. The characteristics and morphological properties observed indicated that the organisms were probably bdellovibrio plaque-forming units. There were no apparent relationships between the number of bdellovibrios iso-

lated from the sampling stations and the measured environmental parameters or the total number of bacteria recovered. Bdellovibrios were isolated from 8 of the sampling stations. Higher numbers than previously reported with sea or ocean water were recovered in the midregion of the bay. (Small-FRC)
W81-02845

ENUMERATION AND CHARACTERIZATION OF STANDARD PLATE COUNT BACTERIA IN CHLORINATED AND RAW WATER SUPPLIES,
Oregon State Univ., Corvallis. Dept. of Microbiology.
M. W. LeChevallier, R. J. Seidler, and T. M. Evans.
Applied and Environmental Microbiology, Vol 40, No 5, p 922-930, November, 1980. 2 Fig, 4 Tab, 27 Ref.

Descriptors: *Bacterial analysis, *Separation techniques, *Drinking water, *Raw water, Water quality data, Chlorination, Water supply, Actinomyces, Aerobacter, Enterobacter.

A simple scheme to rapidly identify standard plate count (SPC) bacteria is proposed, and the incidence and distribution of these organisms in chlorinated drinking water and raw surface water supplies of an Oregon coastal community were determined. Samples were collected from the drinking water supply of a community of 14,000 residents and from two streams supplying raw water to the city. Nearly 700 SPC bacteria were isolated from the two types of water and identified as to genus, species, or group. In the chlorinated water, Actinomycetes and Aeromonas species were the two most common groups. In the raw water, Aeromonas spp. and Enterobacter agglomerans were the two most common groups. Identification of bacterial populations before and after contact with chlorine at doses of 1 to 2 mg/liter for 1 hr revealed that chlorination selects for gram-positive bacteria. The membrane filter technique for enumerating SPC bacteria was found to recover significantly higher numbers than the standard pour plate technique. Thus, this is a useful method for determining water quality deterioration within a distribution system. (Small-FRC)
W81-02848

DETECTION OF LIPID DEGRADATION PRODUCTS IN THE WATER OF A RESERVOIR DURING A BLOOM OF SYNURA UVELLA,
Tuebingen Univ. (Germany, F.R.). Inst. fuer Chemische Pflanzenphysiologie.
F. Juttner.
Applied and Environmental Microbiology, Vol 41, No 1, p 100-106, January, 1981. 4 Fig, 4 Tab, 28 Ref.

Descriptors: *Organic compounds, *Algae, *Lipids, *Odor, Synura uvella, Eutrophication, Biodegradation, Aquatic algae, Pollutant identification, Analytical techniques, Water analysis, *Reservoirs, Odor-producing algae.

The offensive cod liver oil-like odor present in a reservoir during a Synura uvella bloom was attributed to trans,cis-deca-2,4-dienal and trans,cis-hepta-2,4-dienal. These substances and 53 more organic compounds were identified by stripping the volatile compounds from the raw water and detecting by gas-liquid chromatography. Air pollution was considered the source of some aromatic compounds and halogenated compounds. The alkenes (8 carbon), aldehydes (5-10 carbon), alcohols (5-8 carbon), ketones (5-11 carbon), and nor-carotenoids were regarded as algal excretion products. Although the cod liver odor masked all other odors, there were other odor-producing compounds present: beta-ionone (violets), beta-cyclocitral (tobacco), and oct-1-en-3-ol and 2-pentyl furan (both decaying fungi). (Cassar-FRC)
W81-02850

UTILIZATION OF LOW CONCENTRATIONS OF STARCH BY A FLAVOBACTERIUM SPECIES ISOLATED FROM TAP WATER,
Keuringsinstituut voor Waterleidingartikelen, Rijswijk (Netherlands).
D. van der Kooij, and W. A. M. Hijnen.
Applied and Environmental Microbiology, Vol 41, No 1, p 216-221, January, 1981. 5 Fig, 4 Tab, 29 Ref.

Descriptors: *Organic compounds, *Bacteria, *Starch, Carbohydrates, Flavobacteria, *Potable water, Pollutant identification, Water analysis, Analytical techniques, Microorganisms, Netherlands.

A yellow-pigmented bacterium of the Flavobacterium species was identified in tap water from the municipal Dune Waterworks, The Hague, The Netherlands. Here, dune-infiltrated river water is treated with powdered activated carbon, rapid sand filtration, and slow sand filtration. Dissolved organic carbon levels in the finished water were 2-3 mg C per liter. Although the bacteria were able to multiply in the plain tap water, addition of small amounts of starch and glucose (as low as 1 microgram carbon per liter) enhanced growth. Substrate affinities of the Flavobacterium were 3.9 micrograms of starch C and 3.3 micrograms of glucose C per liter. (Cassar-FRC)
W81-02851

RECOVERY OF COLIPHAGES FROM WASTE WATER EFFLUENTS AND POLLUTED LAKE WATER BY THE MAGNETITE-ORGANIC FLOCCULATION METHOD,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
G. Bitton, L. T. Chang, S. R. Farrah, and K. Clifford.
Applied and Environmental Microbiology, Vol 41, No 1, p 93-96, January, 1981. 4 Tab, 16 Ref.

Descriptors: *Flocculation, *Coliphages, *Water analysis, Microorganisms, *Bacteriophage, Effluents, Pollutant identification, Analytical techniques, Waste water.

A flocculation method using magnetite and isoelectric casein was used to recover coliphages from waste water effluent and sewage-contaminated lake water. It is rapid (30 min flocculation time), inexpensive, efficient, and suitable for field use. The method does not require centrifugation or filtration, only a large beaker and a U-shaped permanent magnet. Using the technique, 68, 90, and 100% of coliphages were recovered from activated sludge, trickling filter and primary effluents, respectively, working more effectively with the more concentrated effluents. Recovery of coliphages from a lake showed 230 to 1900 plaque forming units per liter. (Cassar-FRC)
W81-02852

SIMPLE METHOD FOR CONCENTRATION OF BACTERIA FROM LARGE VOLUMES OF TAP WATER,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
S. M. Goyal, and C. P. Gerba.
Applied and Environmental Microbiology, Vol 40, No 5, p 912-916, November, 1980. 5 Tab, 15 Ref.

Descriptors: *Filters, *Bacteria, *Separation techniques, *Drinking water, Escherichia coli, Salmonella, Microorganisms.

The use of positively charged depth filters for the concentration and detection of bacteria in large volumes of tap water was investigated. Dechlorinated tap water was passed under positive pressure through positively charged filter media. At ambient pH levels, more than 90% of seeded bacteria adsorbed to the filters. Adsorbed bacteria were eluted by passing a small volume of Trypticase soy broth opposite to the inflow. Using this technique, E. coli and Salmonella serovar B organisms in 20 liters of tap water were concentrated in a final volume of 50 ml. The average recovery efficiency was 30% or greater. The filters used consisted of a cellulose diatomaceous earth-charge-modified resin such as series S, Zeta-plus, (AMF CUNO, Meriden, Conn.) and eliminated the need for extensive acidification of the initial sample. The method could be useful when the concentration of bacteria is extremely low or could be used in conjunction with other methods for the rapid determination of microorganisms in water. (Small-FRC)
W81-02853

ORGANOCHLORINE COMPOUNDS IN MUSSELS FROM SCOTTISH COASTAL WATERS,
Freshwater Fisheries Lab., Pitlochry (Scotland).
A. A. Cowan.
Environmental Pollution (Series B), Vol 2, No 2, p 129-143, 1981. 4 Fig, 10 Tab, 24 Ref.

Descriptors: *Mussels, *Bioindicators, *Pesticide residues, Dieldrin, DDT, Water quality, Organic pesticides, Sea water, Chlorides, Water quality, *Scotland, *Coastal waters.

Mytilus edulis was used as a bioindicator to study the extent of pollution of Scottish coastal waters by pesticides and PCBs. Homogenates of total shell contents were made of between 29 and 50 animals, and organochlorine residue analysis was carried out. Concentrations of dieldrin, PCB, hexachlorocyclohexane, hexachlorobenzene, and total DDT were determined. The concentrations found ranged from one to three orders of magnitude. Mussels were found to be useful organisms for identifying areas significantly contaminated by organochlorines. The influence of the size, sexual maturity, and flushing procedure on the pesticide content in the mussel has not been fully determined, but changes are thought to be smaller than those found between polluted and clean areas. In this study, four sites were polluted by all three components, seven by two, and ten sites by one pollutant. (Small-FRC)
W81-02858

DETERMINATION OF MAGANESE IN NAIAD MOLLUSC SHELLS BY NEUTRON ACTIVATION ANALYSIS,
Ohio State Univ., Columbus.
R. T. Pruiskma, T. R. Sweet, D. H. Stansbery, and B. K. Hajek.
Environmental Pollution (Series B), Vol 2, No 1, p 49-57, January, 1981. 5 Fig, 1 Tab, 7 Ref.

Descriptors: *Bioindicators, *Mollusks, *Naiads, *Manganese, Rivers, Shellfish, Aquatic animals, Pollutant identification, Analytical techniques, Absorption, Water pollution effects, Path of pollutants, Muskingum River, *Ohio.

Shells from naiads in the Muskingum River, Ohio, were analyzed for manganese content by neutron activation analysis to determine their possible use as bioindicators of water pollution. Two species were obtained at Beverly, O., and 5 species 11 miles downstream at Lowell, O. The shells were part of a university museum collection. Mn concentrations at Beverly were as follows (in ppm): Obliquaria reflexa, 529 (1965), 1008 (1966), 646 (1967); Quadrula pustulosa, 509 (1965), 694 (1966), 591 (1967), and 408 (1968). At Lowell concentrations were Quadrula quadrula, 412-304 (1967-68); Amblema plicata, 366 (1967), 479 (1968); Obovaria subrotunda, 396 (1967), 354 (1968); Obliquaria reflexa, 862 (1965), 750 (1966); and Quadrula pustulosa, 276 (1965), 320 (1966), 328 (1967), and 403 (2068). Differences in manganese concentrations depending on species and year were observed in some cases. A significant (2% level) difference was found in Q. pustulosa manganese levels at the two locations studied, possibly due to differences in manganese content of the water as a result of coal mine drainage. (Cassar-FRC)
W81-02859

AFFINITY TESTS FOR THE DETECTION OF COMMUNITY ALTERATION IN PLANKTON: EVALUATION WITH A DISTRIBUTIONAL COMPUTER MODEL,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5C.
W81-02860

DETECTION OF DIMETHYLNITROSAMINE AND DIETHYLNITROSAMINE IN MUNICI-

Group 5A—Identification Of Pollutants

PAL SEWAGE SLUDGE APPLIED TO AGRICULTURAL SOILS,
Wright State Univ., Dayton, OH. Dept. of Biological Sciences.
W. S. Brewer, A. C. Draper, III, and S. S. Wey.
Environmental Pollution (Series B), Vol 1, No 1, p 37-43, January, 1980. 1 Fig, 1 Tab, 21 Ref.

Descriptors: *Sludge disposal, *Organic compounds, *Nitrogen compounds, Nitrosamines, Agriculture, Soil amendments, Sewage sludge, Water pollution sources, *Pollutant identification, Path of pollutants, DMN, DEN.

Sludges applied to agricultural soils contained a mean dimethyl nitrosamine content of 0.272 micrograms per gram (wet basis). Between 59.8-1365 micrograms nitrosamine may be incorporated into 1 cubic meter of soil at a mean application rate of 1.95 kg per sq meter per year. Nitrosamines, known to be carcinogenic, mutagenic, and teratogenic, and believed persistent in soils, could accumulate in groundwater, surface water, and plant material if applied as a soil amendment to agricultural land. Three analytical methods were used to analyze 16 samples of municipal waste water sludge--gas-liquid chromatography, thin-layer chromatography, and colorimetry. The colorimetric method detected nitrosamines in 11 samples. Using both chromatographic methods, either dimethyl nitrosamine, diethyl nitrosamine, or both were detected in a total of 8 samples. (Cassar-FRC)
W81-02866

ISOLATION AND IDENTIFICATION OF AN AMES-MUTAGENIC COMPOUND PRESENT IN KRAFT CHLORINATION EFFLUENTS,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
B. R. Holmbom, R. H. Voss, R. D. Mortimer, and A. Wong.
Tappi, Vol 64, No 3, p 172-174, March, 1981. 2 Fig, 8 Ref.

Descriptors: *Pulp wastes, *Chlorination, *Effluents, Organic compounds, Mutagenesis, Pollutant identification, Bacteria, Industrial wastes, Wastes.

An Ames-mutagenic compound in kraft chlorination effluents was tentatively identified as 3-chloro-4-dichloromethyl-5-hydroxy-2(5H)-furanone on the basis of high resolution mass spectroscopy and ultraviolet and infrared spectroscopic data. Concentration of this compound is 5-10 micrograms per liter in the original effluent. It has an Ames mutagenicity of 10,000 revertant counts per nanomole using TA100 with no S-9 addition as a test strain. The original effluent had an Ames mutagenicity of 2,000-3,000 revertants per ml effluent. (Cassar-FRC)
W81-02875

YEASTS FROM MARINE AND ESTUARINE WATERS WITH DIFFERENT LEVELS OF POLLUTION IN THE STATE OF RIO DE JANEIRO, BRAZIL,
Universidade Federal do Rio de Janeiro (Brazil). Dept. de Microbiologia Geral.
A. N. Hagler, and L. C. Mendonca-Hagler.
Applied and Environmental Microbiology, Vol 41, No 1, p 173-178, January, 1981. 1 Fig, 3 Tab, 29 Ref.

Descriptors: *Yeasts, *Coliforms, *Rio de Janeiro, Brazil, Microorganisms, *Estuaries, *Pollutant identification, Water pollution, Bacteria, Sewage bacteria, Bioindicators.

Yeasts were determined in water samples from 24 sites in the area of Rio de Janeiro, Brazil. Pollution levels and mean total coliform counts were as follows: heavy, 340,000 CFU per 100 ml; moderate, 9,600; light, 230; and nil, 73. Mean salinities varied from 14.2 to 27.4% in the estuarine sites. Mean total yeast counts for these 4 classifications of water were 2800, 200, 9.9, and 0.58 CFU per 100 ml. The most prevalent were Candida, Rhodotorula, Torulopsis, Hanseniaspora, Debaryomyces, and Trichosporon. Twenty-one species represented 86% of the total yeast counts. Although pink yeasts have been suggested as bioindicators for pollution, this study shows that they do not represent a consistent proportion of the yeast population and are not correlated with other specific pollution factors. (Cassar-FRC)
W81-02885

COMPARISON OF THE DIFFERENT METHODS FOR THE RECOVERY OF SUSPENDED MATTER FROM ESTUARINE WATERS: DEPOSITION, FILTRATION AND CENTRIFUGATION: CONSEQUENCES FOR THE DETERMINATION OF SOME HEAVY METALS,
Institut de Geologie du Bassin D'Aquitaine, Talence (France).
H. Etcheber, and J. M. Jouanneau.
Estuarine and Coastal Marine Science, Vol 11, No 6, p 701-707, December, 1980. 4 Tab, 12 Ref.

Descriptors: *Estuaries, *Heavy metals, *Separation techniques, Deposition, Filtration, Centrifugation, *Suspended solids, Metals, Analytical techniques, Water analysis, Gironde estuary, *France, Pollutant identification, Zinc, Copper, Manganese, Iron, Nickel, Lead, Turbidity.

Methods for recovery of suspended matter to determine heavy metal concentrations were compared in samples obtained from the Gironde estuary. Filtration produced the best recovery. Deposition was most useful in cases of flocculation and high turbidity. Centrifugation was satisfactory in zones of low turbidity. On low turbidity waters differences in the three methods were not significant for Fe, Mn, and Zn. However, deposition lost 20% of the Cu, 14% of the Pb, and 10% of the Ni when compared with filtration. Centrifugation caused increases in Ni (40%), Pb (12%), and Cu (uneven), possibly from equipment contamination. Analyses of high turbidity waters produced similar results with all 3 methods, but slight contamination of the Ni determinations occurred with centrifugation. (Cassar-FRC)
W81-02888

SIMULTANEOUS MEASUREMENTS OF TRANSPARENCY AND IRRADIANCE IN THE COASTAL WATERS OF NORTH WALES,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
B. J. Topliss, J. R. Hunter, and J. H. Simpson.
Marine Environmental Research, Vol 4, No 1, p 65-79, 1980-81. 4 Fig, 2 Tab, 19 Ref.

Descriptors: *Suspended solids, *Sea water, *Optical properties, Turbidity, Light penetration, Attenuation, Physical properties, Water properties, Pollutant identification, Coastal waters, *Wales, Great Britain.

Natural optical conditions of marine waters must be known before comparisons are made with measurements in polluted waters. Therefore, simultaneous measurements of the diffuse attenuation coefficient and the collimated beam attenuation coefficient were made continuously over a year off the coast of North Wales. The ratio of the collimated beam coefficient to the diffuse attenuation coefficient varied throughout the year between 11:1 and 5:1. Both parameters must be measured together to acquire an understanding of the nature of suspended material in the waters. (Cassar-FRC)
W81-02892

HEAVY METALS IN DONAX TRUNCULUS L. (BIVALVIA) IN HAIFA BAY, MEDITERRANEAN (ISRAEL),
Israel Oceanographic and Limnological Research Ltd., Haifa.
H. Hornung, and O. H. Oren.
Marine Environmental Research, Vol 4, No 3, p 195-201, 1980-81. 2 Fig, 3 Tab, 23 Ref.

Descriptors: *Bioindicators, *Mollusks, *Heavy metals, Baseline studies, *Pollutant identification, Analytical techniques, Metals, *Israel, Mediterranean Sea, Haifa Bay, Mercury, Copper, Zinc, Cadmium, Lead, Aquatic animals, Shellfish.

Since the common bioindicator Mytilus is absent from the Israeli Mediterranean shore, Donax (Serrula) trunculus, a mollusk common to this area, was chosen for a baseline study of heavy metal pollution. Mussels were collected in Haifa Bay during November 1975 - September 1978. Concentrations of metals in soft parts of the mussels, expressed in micrograms per gram (dry weight) were as follows: Hg, 0.04-0.91; Cu, 6.13-35.37; Zn, 51.2-141.6; Cs, 0.19-0.66; and Pb, 1.56-13.07. An inverse correlation between shell length and metal concentration was found for all metals but Pb. The author suggests that Donax trunculus should not be defined as an indicator of heavy metal pollution without a sampling program which includes the entire Israel coast. (Cassar-FRC)
W81-02894

5B. Sources Of Pollution

SEDIMENT AND ORGANIC MATTER TRANSPORT IN OREGON COAST RANGE STREAMS,
Oregon State Univ., Corvallis. School of Forestry.
R. L. Beschta, S. J. O'Leary, R. E. Edwards, and K. D. Knoop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193914, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Oregon State University Report WRRI-70, February, 1981. 67 p, 20 Fig, 4 Tab, 49 Ref. OWRT-A-042-ORE(1), 14-34-0001-7078.

Descriptors: *Pollution load, *Sediment transport, *Organic matter, Streamflow, *Oregon, *Coastal streams, Mathematical equations, Environmental protection, Nonpoint pollution sources, Population exposure, Tractive forces, Sediment grading, Sediment concentration, Sediments, Aquatic soils, Water quality, Organic loading, Flow, Streamflow forecasting, Coastal waters, Rating flumes, Suspended solids, Turbidity, Particulate matter.

The overall objective of this study was to provide an improved understanding of sediment and organic matter movement in mountain streams, utilizing monitoring of two streams, Flynn Creek and Oak Creek, located in Central Oregon's Coast Range, for bedload transport, particulate organic matter transport, total suspended solids (TSS) concentration, and turbidity. Winter precipitation was relatively low during the 1976-1980 water years studied; frequency analysis indicated peak flows had recurrence intervals of less than two years. Rating curves were developed through the relationship that particulate transport equalled a constant times streamflow (Q) to some power. Exponential increases of 3.4-4.5 in bedload transport rates with increasing flows were measured using vortex tube and Helley-Smith bedload samplers. Sediment particle diameter averaged less than 0.5 and 2 mm for Flynn and Oak Creeks, respectively. Rating curves of TSS with Q varied highly, but exponential TSS increases with increasing Q were generally 1.1-1.6 when flow ranges were sampled. Hydrograph characteristics, Q, and the storm events sequence influenced TSS, which averaged about 60% inorganics and 40% organics. TSS correlated highly with turbidity, and both returned to relatively low levels within 24 hours after peak flow occurrences. (Zielinski-IPA)
W81-02652

MECHANISMS OF TRANSPORT OF COPPER, CADMIUM AND CHROMIUM IN SOILS,
California Univ., Davis. California Water Resources Center.
J. W. Biggar, K. K. Tanji, D. R. Nielsen, and R. J. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193922, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, March, 1981. 81 p, 59 Fig, 10 Tab, 26 Ref. (California Water Research Project UCAL-WRC-W-511). OWRT-B-180-CAL(2).

Descriptors: *Pollution load, Soil analysis, Soil chemistry, *Soil contamination, *Heavy metals, *Path of pollutants, Soil dynamics, Soil environment, Soil adsorption capacity, Soil profiles, Soil

properties, Soil science, Soil tests, Soil types, Fate of pollutants, Trace metals, Copper, Cadmium, Chromium, Model studies.

Copper (Cu) in the saturation extract of dried Davis, California, sewage sludge was mainly in complexed form; the extent of complexation determined with a cupric specific ion electrode. Adsorption experiments showed a distribution coefficient (Kd) of 4.0 for complexed Cu on Yoho soil, while Cu added as cupric sulfate had a Kd of 90 cubic-centimeters/gram. The low Kd values on soil and the large percentage of complexed Cu suggested that sewage sludge may be a potential source of contamination of water and plant systems. A general model for trace metal adsorption was studied; an equation for multi-speciated metal adsorption was developed, accounting for both exchange and chemical adsorption. The model was compared with experimental data. Transport of cadium (Cd) in Hanford sandy loam and Yoho silt loam soil was studied using soil columns, adsorption/desorption curves, breakthrough curves (BTC) and the significant effects of EDTA and pH on position/shape of the BTC. A suitable model is lacking to describe the position/shapes of the BTC, but a model to describe batch reaction results was partially successful. (Zielinski-IPA)
W81-02653

THE DISTRIBUTION, TRANSPORT AND CYCLING OF DISSOLVED AND PARTICULATE ORGANIC CARBON IN THE POTOMAC AND ANACOSTIA RIVERS IN THE GREATER WASHINGTON AREA,
American Univ., Washington, DC. Dept. of Biology.
M. A. Champ.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193955, Price codes: A06 in paper copy, A01 in microfiche. D.C. Water Resources Research Center, University of the District of Columbia, Washington, Report No 13, November, 1979. 103 p, 23 Fig, 26 Tab, 34 Ref, 1 Append. OWRT-A-002-DC(1), 14-31-0001-50502.

Descriptors: *Dissolved solids, *Urban runoff, *Particulate matter, *Organic carbon, Organic loading, Sediment transport, Cycling nutrients, Organic matter, Chemical analysis, Biological oxygen demand, Chemical oxygen demand, Pollution load, Streamflow, Water quality, Rivers, Suspended solids, River basins, River beds, Water analysis, Runoff, River flow, Surface runoff, Combined sewers, Effluent streams, *District of Columbia, Potomac River estuary, Anacostia River.

This project was undertaken to study the distribution, transport, seasonal cycling, and sources of dissolved organic carbon (DOC) and particulate organic carbon (POC) in the two subject District of Columbia area rivers, since rivers of high organic concentrations can have high BOD and COD values that lower oxygen concentrations to levels that can cause high mortality in aquatic life. DOC and POC concentrations were measured weekly for 17 main channel stations of the Upper Potomac River Estuary, and the distribution, production, transport and cycling of organic carbon was followed over a 12-month period. Special studies were conducted to evaluate the influence of tidal activity, flood storm crests and lateral variation on River DOC and POC levels. Mean DOC and POC levels reflected a seasonal and river mile sigmoid curve. DOC and POC transported annually by the Potomac to its Estuary were estimated at 54,000 and 37,000 metric tons, respectively. River DOC did not correlate with discharge, which POC does. DOC and POC levels in street runoff, storm and combined sewer overflows were 4-10 times higher than in Potomac River water. (Zielinski-IPA)
W81-02656

EFFECTS OF THE PROPOSED PROSPERITY RESERVOIR ON GROUND WATER AND WATER QUALITY IN LOWER CENTER CREEK BASIN, MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.
W. R. Berkas, and J. H. Barks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-152621, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-88, November 1980. 29 p, 6 Fig, 9 Tab, 8 Ref.

Descriptors: *Reservoir sites, *Groundwater, *Water quality, *Surface-groundwater relationships, *Baseline studies, *Missouri, Karst, Base flow, Groundwater movement, Groundwater recharge, Water levels, Seepage, Tracers, Tracking techniques, Mine water, Zinc, Fertilizers, Nitrates, Nutrients, Center Creek basin(MO), *Prosperity Reservoir(MO).

Effects of the proposed Prosperity Reservoir on groundwater and water quality in lower Center Creek basin, Mo., depend partly on the effectiveness of Grove Creek as a hydrologic boundary between the reservoir site and the Oronogo-Duenweg mining belt. Results of two dye traces indicate that Grove Creek probably is not an effective boundary. Therefore, higher water levels near the reservoir could cause more groundwater to move into the mining belt and cause a greater discharge of zinc-laden mine water into Center Creek. Fertilizer industry wastes discharged into Grove Creek resulted in significant increases of nitrogen and phosphorus in lower Center Creek. Results of seepage runs confirm that mine-water discharge and seepage account for the increased zinc concentrations in Center Creek during base flow. The nutrient and zinc concentrations in Center Creek, after the completion of the proposed reservoir, would depend upon the release schedule. (USGS)
W81-02678

CHEMICAL AND PHYSICAL CHARACTERISTICS OF WATER IN ESTUARIES OF TEXAS, OCTOBER 1974-SEPTEMBER 1975,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 2L.
W81-02684

A WATER-QUALITY MONITORING NETWORK FOR VALLECITOS VALLEY, ALAMEDA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
C. D. Farrar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-157034, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-59, October 1980. 22 p, 5 Fig, 2 Tab, 12 Ref.

Descriptors: *Water quality, *Monitoring, *California, *Radioactive wastes, *Radioisotopes, Path of pollutants, Water pollution sources, Effluents, Dissolved solids, Groundwater, Water wells, Sampling, Sites, Water analysis, Vallecitos Valley, Alameda County.

A water-quality monitoring network is proposed to detect the presence of and trace the movement of radioisotopes in the hydrologic system in the vicinity of the Vallecitos Nuclear Center, Alameda County, Calif. The source of the radioisotopes is treated industrial wastewater from the Vallecitos Nuclear Center that is discharged into an unnamed tributary of Vallecitos Creek. The effluent infiltrates the alluvium along the stream course, percolates downward to the water table, and mixes with the native ground water in the subsurface. The average daily discharge of effluent to the hydrologic system in 1978 was about 100,000 gallons. In Vallecitos Valley, the Livermore Gravel and the overlying alluvium constitute the groundwater reservoir. There is no subsurface inflow from adjacent groundwater basins. Groundwater flow in the Vallecitos subbasin is toward the southwest. The proposed network consists of four surface-water sampling sites and six wells to sample the groundwater system. Samples collected monthly at each site and analyzed for tritium and for alpha, beta, and gamma radiation would provide adequate data for monitoring. (USGS)
W81-02685

SEAWATER INTRUSION AND POTENTIAL YIELD OF AQUIFERS IN THE SOQUEL-APTOS AREA, SANTA CRUZ COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
K. S. Muir.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-168759, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-84, October 1980. 29 p, 19 Fig, 3 Tab, 2 Ref.

Descriptors: *Saline water intrusion, *Groundwater movement, *Water pollution sources, *Groundwater availability, *California, Water yield, Aquifers, Water wells, Pumping, Water level fluctuations, Monitoring, Observation wells, Water storage, Water utilization, Soquel-Aptos area, Santa Cruz County.

Seawater has intruded the Purisima Formation in the interval 0-100 feet below sea level in the Soquel-Aptos area. It occurs in the central part of the area and extends inland about half a mile. The potential yields of the two principal aquifers in the Soquel-Aptos area are 4,400 acre-feet per year from the Purisima Formation and 1,500 acre-feet per year from the Aromas Sand. Pumping from the Purisima Formation, averaging about 5,400 acre-feet per year since 1970, has caused water levels along the coast to decline below sea level and has allowed seawater to enter the aquifer. Seawater intrusion and ground-water storage could be monitored in all depth zones by expanding the observation-well network to include a number of shallow wells, one deep well inland from the coast, and three deep wells along the coast. (USGS)
W81-02690

CHEMICAL AND MINERALOGICAL COMPOSITION AND BEHAVIOR OF THE MANCOS SHALE AS A DIFFUSE SOURCE OF SALTS IN THE UPPER COLORADO RIVER BASIN,
California Univ., Davis. Dept. of Land, Air and Water Resources.
V. P. Evangelou.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-197626, Price codes: A11 in paper copy, A01 in microfiche. Ph.D. Dissertation, March, 1981. 198 p, 57 Fig, 26 Tab. (Water Resources Center Project UCAL-WRC-W-562). OWRT-B-201-CAL(1).

Descriptors: *Salinity, *Mineralogy, *Shales, Saline soils, Soil chemical properties, Water quality, *Colorado River Basin, Colorado River, Dolomite, Magnesium, Carbonates, West Salt Creek watershed, Colorado, Mancos Shale.

Previous investigations relative to salinity in the upper Colorado River Basin have mostly dealt with the total quantities of dissolved solids moving into the Colorado River. Soluble components resulting from dissolution of mineral species have been studied as separate physical entities in the Colorado River, in tributaries of the river and in the Mancos Shale formation. Thus, the Mancos shale itself has been treated basically as an inert material without consideration of possible interactions between soluble and insoluble phases. The purpose of this investigation is to conduct a thorough study of mineralogical and chemical characteristics of Mancos Shale itself has been treated basically as an inert material without consideration of possible interactions between soluble and insoluble phases. The purpose of this investigation is to conduct a thorough study of mineralogical and chemical characteristics of Mancos Shale within the West Salt Creek watershed, Colorado. The investigation focuses on the Mancos Shale as a source of soluble components contributing to salinity of the Colorado River including interactive relationships between the more soluble and less soluble mineral phases. The overall investigation has revealed the primary source of salts. Salts are derived from carbonates, calcite and dolomite, which upon contact with sulfuric acid (produced by the biological oxidation of pyrite), produce gypsum and magensium sulfates. A second source is gypsum as a product of the marine environment left after evaporation had occurred. A third source

is the continuous release of ions from such sources as dolomite, feldspars and micas. Finally, a fourth source is the leaching of ions of sodium and magnesium coming off the exchange complex of the unweathered Mancos Shale formation. (Snyder-California)
W81-02711

INTERCHANGE OF POLLUTANTS BETWEEN GROUNDWATER AND MINERAL STRATA AS APPLIED TO WASTE CHEMICAL DUMPS AND IN SITU COAL GASIFICATION SITES,
Missouri Univ.-Columbia. Dept. of Chemistry.
S. E. Manahan, P. Tobben, R. Gale, S. Hoeffner, and D. Bornhop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198335, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, University of Missouri, Completion Report, March 15, 1981. 16 p, 9 Fig. OWRT-A-117-MO(1), 14-34-0001-0127.

Descriptors: *Water pollution, *Hazardous wastes, Coal, Coal gasification, Char, *Waste dumps, Organic pollutants, Phenols, Chemical wastes, *Groundwater pollution, *Leachates.

The overall objective of this research was to study the interchange of pollutants between minerals and groundwater produced as leachate from waste chemical dumps and as a by-product of in situ (underground) coal gasification. Particular emphasis was placed upon the development of methods to evaluate the chemical interaction between contaminated groundwaters and specific solids so that these methods could be applied to specific situations which other investigators might need to study. Of particular importance was the development of methods to obtain chemical data which in turn can be used to provide meaningful bases for modelling groundwater contamination. Water contaminated by vapor from laboratory-simulated in situ coal gasification was employed as a model polluted water. The solids used to sorb organics from this waster were subbituminous coal, non-activated coal char, activated coal char, and coal ash.
W81-02714

EFFECTS OF FLY ASH HEAVY METALS ON *DAPHNIA MAGNA*,
Missouri Univ.-Kansas City. Dept. of Biology.
M. S. Stern, and D. H. Stern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198327, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, University of Missouri, Columbia, Completion Report, December 30, 1980. 58 p, 9 Fig, 9 Tab, 62 Ref. OWRT-A-120-MO(1), 14-34-0001-9027.

Descriptors: *Fly ash, *Heavy metals, Daphnia magna, Cadmium, Bioassay, Bioaccumulation, Coal, *Water pollution effects, *Aquatic life.

The purpose of this study was threefold: (1) To analyze the concentrations of heavy metals released from two different fly ashes in alkaline Missouri waters and their effect on the pH; (2) to determine the LC sub 50 and the chronic toxicity concentrations of fly ash that killed or impaired the reproductive capacity of Daphnia magna; and (3) to study the possible bioaccumulation of cadmium from fly ash by D. magna. Results of acute toxicity tests with D. magna indicated that older daphnids tolerated higher concentrations of fly ash better than did juveniles. Unfed adults were more susceptible to the effects of fly ash from Illinois coal than were fed ones. The fly ash from the western coal affected both juveniles and adults very differently from the Illinois ash. There were no significant differences in LC sub 50 values between juveniles and adults or between fed and unfed daphnids. Toxicity effects from the western coal fly ash were expressed almost immediately, while effects from the other ash required several days. The total number of young produced was the most sensitive indicator of chronic toxicity. A comparison of 96-h acute data with 21-d chronic data for both ashes were not significantly different, thus indicating that cummulative toxicity was apparently not significant for these ashes. Cadmium was accumulated from both fly ashes by Daphnia magna. The greatest accumulation occurred in unfed adult daphnids after 96-h exposure. There was no additional total accumulation of cadmium in the 21-d daphnids when compared to fed 6-d old daphnids.
W81-02715

SIMULATION OF THE DISTRIBUTION OF POLLUTED WATER IN RESERVOIRS FROM CONCENTRATED EMISSIONS,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
A. V. Karaushev, and V. V. Romanovskiy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, Michigan, Environmental Protection Agency Report 600/9-80-033, July 1980. p 12

Descriptors: *Simulation analysis, *Pollutants, Pollutant load, *Reservoirs, *Lakes, *Eddy diffusion, Water pollution sources, Turbulent flow, Reservoirs.

In periods of calm without unidirectional currents, or when the surface is ice-covered, patches of pollutants may develop in lakes and reservoirs around the emission point. The patch moves as a result of emission of new waste water and turbulent diffusion. The process of diffusion of pollutants can be simulated on the basis of a differential equation for turbulent diffusion in cylindrical coordinates. The equation can be used to determine diffusion from emission points at the shore or in an open body of water, and for conservative or non-conservative substances. From this equation, equations are developed for the calculation of the field of concentration. A series of calculations is required for each interval of time under consideration, and for conservative substances, the concentration value is verified based on calculation of the total mass of the substance. (Brambley-SRC)
W81-02736

TRANSPORT OF MINING WASTE IN LAKE SUPERIOR,
Environmental Research Lab., Duluth, MN.
M. Sydor, G. E. Glass, and W. R. Swain.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, Aug 27-30, 79, Bloomfield Hills, MI. EPA Report 600/9-80-033, Jul 80. p 180-196, 9 Fig, 3 Tab, 14 Ref.

Descriptors: *Particulate matter, *Mine wastes, *Mathematical models, *Satellite technology, *Lake Superior, Sediment transport, Remote sensing, Upwelling, Water pollution, Suspended solids, Model studies, Plumes, Turbidity, Wind, Water currents.

The western arm of Lake Superior has a 100 km trough which extends along the Minnesota shoreline from Knife River, Minnesota where the trough is 180 m deep past Silver Bay, Minnesota, where depths range around 250 m. An average of 67,000 tons of fine iron ore tailings are discharged at Silver Bay into the lake every day. The transport of particulates can be investigated through use of remote sensing and numerical modeling. Fine particulates in lakes are identifiable through use of Landsat data. For one wind episode, transport and dispersal of a plume is simulated numerically for the actual wind and pressure conditions over the lake. The model results are subsequently compared with measurements of suspended solids and the remote sensing data for the plume. The results show that the direct transport of tailings cannot readily account for the episodes of high concentration of tailings at the Duluth water intake. In the second example, Landsat images for two consecutive days show discrete high concentration patches of tailings which appear to have upwelled during westerly winds. The successive images and current measurements at two station show that tailing spatches are transported in accordance with the results from numerical models. The patches appear to have originated from an upwelling near the Duluth water intake. The data for the intake show that the concentration of tailings in the patches exceeded 3 mg/l, a level which is an order of magnitude higher than the concentrations produced by the direct transport of turbidity to Duluth. (Moore-SRC)
W81-02739

THE TRANSPORT OF CONTAMINANTS IN LAKE ERIE,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
W. Lick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, Aug 27-30, 79, Bloomfield Hills, MI. Environmental Protection Agency Report 600/9-80-033, Jul 80, p 261-305. 20 Fig, 33 Ref

Descriptors: Lakes, *Mathematical models, *Water pollution, *Water circulation, *Sediment transport, Model studies, Wave action, Pollutants, Sediment concentration, Stratification, Suspended sediments, *Lake Erie, Path of pollutants.

In order to understand more thoroughly and be able to predict the transport and fate of contaminants in lakes, the physical processes of transport have been studied in Lake Erie. The Western Basin of Lake Erie is quite wide but extremely shallow; because of this, and because of large inputs of sediments from the Maumee and Detroit Rivers and from shore erosion, there are large sediment concentrations and variations in sediment concentration in the Western Basin. These large variations in sediment concentration make the Western Basin particularly amenable to sediment transport analyses. The results of investigations of sediment resuspension and depostion, wave action, and currents were coupled with the sediment mass balance equation, and used to calculate the sediment concentrations during a specific, short-term event from 8 March to 11 March 1976 in the Western Basin. Near the southern shore there is reasonable agreement between the observations and calculations. In other areas, significant discrepancies exist. It is believed that the major reason for this is an inadequate knowledge of the sediment resuspension and deposition rates throughout the Basin. Transport in the Central Basin of Lake Erie during summer stratification was studied using a two-dimensional model. Calculations were made using a constant depth basin 100 km wide and 25 m deep, and a variable depth basin corresponding to a section across the Central Basin from Ashtabula, Ohio to Port Stanley, Ontario. The calculations are in reasonable agreement with observations. (Moore-SRC)
W81-02744

SELF-ORGANIZATION OF THREE-DIMENSIONAL MODELS OF WATER POLLUTION,
Akademiya Nauk URSR, Kiev.
A. G. Ivakhnenko, and G. I. Krotov.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, Aug 27-30, 79, Bloomfield Hills, MI. EPA Report 600/9-80-033, Jul 80, p 306-342. 13 Fig, 6 Ref.

Descriptors: *Model studies, *Mathematical models, *Water pollution, *Computers, Mathematical studies, Computer models, Path of pollutants.

The basic shortcomings of the deductive method is the need for a priori production of sufficiently complete and accurate information on the subject. Imprecise knowledge of even a single characteris-

tic can make the result of modeling incorrect. According to the theorem of incompleteness of Godel, the so-called internal criteria utilized by deductive mathematics, are not suitable for selection of the structure of a model of optimal complexity. In contrast, external criteria pass through a minimum as the model becomes increasingly complex, and this minimum defines a model of optimal complexity. The new inductive method of modeling, self organization of models by computer, is directed toward comprehensively decreasing the volume of a priori information required for modeling. In contrast to deductive mathematics, methods of self-organization are based on the use of external criteria: regularity, minimum bias, balance of variables, convergence of a multi-step prediction, and combined criteria. The principle of self-organization can be formulated as follows: with gradual complication of models, finds this minimum and indicates the unique model of optimal complexity. (Moore-SRC)
W81-02745

THE DISTRIBUTION OF SEDIMENTS AND PARTICULATE CONTAMINANTS FROM COMBINED SEWER AND STORM DRAIN OVERFLOWS I SEATTLE'S NEARSHORE WATERS,
Municipality of Metropolitan Seattle-METRO, WA.
R. D. Tomlinson, B. N. Bebee, R. G. Swartz, S. Lazoff, and D. E. Spyridakis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche. In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, Nov 26-28, 1979, EPA Report EPA 600/9-80-056, December, 1980, p 115-146. 11 Fig, 5 Tab, 11 Ref.

Descriptors: *Storm runoff, *Storm wastewater, *Combined sewers, *Sediment distribution, *Lake Washington, Flow pattern, Particulate matter, Outfall sewers, Sediments, Heavy metals, Chlorinated hydrocarbons, Water pollution sources, Turbidity flow, Sediment transport, Storm sewers, Washington, Seattle area.

The locations and dimensions of the sewer outfalls in Lake Washington, Washington were mapped and measured. The map includes 23 emergency outfalls, 34 combined sewer outfalls (CSO's), 56 pump stations, and 240 storm drains (SD's). The analyses of sediments collected near 10 CSO's and 10 SD's revealed their widespread enrichment with heavy metals, chlorinated hydrocarbons and organic wastes. This was particularly true of the western nearshore region where all of the CSO's were located. Intensive comparative studies were carried out at one representative CSO and one SD having similar drainage basins and rainfall. Pollutant loading estimates indicated that, whereas mean storm concentrations for most parameters were greater for the CSO, the total annual loading was greater in most instances for the SD, due to its continuous and therefore greater volume of discharge. Effluent turbidity patterns and metals concentration ratios for effluent solids, settling particulates and sediments demonstrated significant local deposition of wastewater particles. The different effects of near-bottom, offshore transport and longshore advection cause different particulate dispersion patterns at the two sites. (Brambley-SRC)
W81-02753

EFFECTS OF COAL-ASH LEACHATE ON GROUND WATER QUALITY,
Tennessee Valley Authority, Chattanooga, TN.
J. D. Milligan, and R. J. Ruane.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-178535, Price codes: A07 in paper copy, A01 in microfiche. Interagency Energy/Environment R & D Program Report, Environmental Protection Agency Report EPA-600/7-80-066, March 1980. 125 p, 28 Fig, 24 Tab, 30 Ref, 4 Append.

Descriptors: *Powerplants, *Settling basins, *Leaching, *Groundwater pollution, Soil types, Monitoring, Wells, Clays, Sand, Dissolved solids, Interstitial water, Water pollution sources, Industrial wastes, Coal-ash leachate.

A field and laboratory project was performed to characterize coal-ash leachate and its attenuation by selected soil types at two TVA power plants. Groundwater monitoring wells were installed around the ash ponds, continuous soil-core samples were collected and analyzed periodically, and ash leachate was percolated through different clays and soils to study attenuation rates. Ash leachate is a chemically reducing solution, usually acidic, with a variable composition characteristically high in total dissolved solids and boron, iron, calcium, aluminum and sulfate. The different coal sources in the study produced ash leachate with similar characteristics. Interstitial water samples contained higher concentrations of metals and were more acidic than well samples. The flux of metals in the ash pond leachate was negligible compared with the ash pond surface overflow. Soils containing a large percentage of clay provide a better medium for attenuating metals from ash leachate than do sandy soils. The use of an inert gas pump provided a means of collecting anoxic groundwater samples while minimizing oxidation. (Brambley-SRC)
W81-02785

COLIFORMS AND FECAL STREPTOCOCCUS IN THE ILLINOIS RIVER AT PEORIA, 1971-1976,
Illinois State Water Survey, Urbana.
S. D. Lin, and R. L. Evans.
Report of Investigation 93, 1980. 32 p, 7 Fig, 11 Tab, 36 Ref, 2 Append.

Descriptors: *Illinois, *Bacterial analysis, *Water pollution, *Water analysis, Water sampling, *Coliforms, Streptococcus, Bacteria, Feces, Chemical analysis, Time series analysis, Dissolved oxygen, Chemical composition, River systems.

Water samples were collected weekly from the Illinois River at Peoria and examined for total coliform (TC), fecal coliform (FC), fecal streptococcus (FS), and 17 chemical and physical parameters. Indicator bacteria, rather than pathogenic organisms, are used because of the laborious technique and expensive equipment required to isolate pathogenic organisms from water. The presence of coliform bacteria in water is generally regarded as evidence of pollution by warm-blooded animals. In the data obtained from June 1971 to May 1976, wide ranges of bacterial densities were observed. About 44% of the time, FC densities complied with the Illinois Pollution Control Board limit of no more than 200 FC per ml. Compliance with the rule that no more than 10% of the samples in a 30-day period may exceed 400 FC per ml. was achieved only 25% of the time. The latter rule was found to be the limiting factor. Approximately 7.1% of the TC densities consisted of FC. Based on FC/TC ratio values, fecal contamination derived from human sources occurred in 41% of the June-August samples. The FC/TC values were low in the winter and spring months and high in the summer and fall. A time series analysis was performed to show the trends, seasonal and cyclical indexes, and irregular factors for the bacterial densities. A surprise was that the bacterial quality of the Illinois River at Peoria is as good as, if not better than, that in one of its tributaries, the Spoon River. This suggests that the assimilative capacity of stream waters and nonpoint sources are important factors in assessing the bacterial quality of streams. (Garrison-Omniplan)
W81-02792

POLLUTION OF SEA WATER AND MARINE SEDIMENTS IN COASTAL AREAS,
Orleans Univ. (France).
S. Berne, M. Marchand, and L. D'Ozouville.
Ambio, Vol 9, No 6, p 287-293, 1980. 6 Fig, 3 Tab, 10 Ref.

Descriptors: *Sediments, *Sea water, *Amoco Cadiz, *Oil spills, Persistence, Water pollution effects, *Path of pollutants, Bottom sediments, Sands, Coasts, Beaches, Degradation(Decomposition), Oil pollution, *France, Tidal waters, Seashores, Tidal marshes, Marshes, Bays.

The path of oil pollution from the Amoco Cadiz spill was followed by analysis of water samples collected at depths from 1 to 20 meters and at 5 meters above the bottom, at different locations, and on different dates throughout the year following the accident. Pollution was widespread during the first month, but had returned to normal values after 3 months except for certain bays and abers. Sediment pollution reflected hydrocarbon contents of the water samples and direction of drift of the slick. Hydrocarbon levels decreased toward the open sea. Although the medium to fine sands were well decontaminated within a year (down to an average of 27 ppm), muddy and slimy sediments remained polluted (above 1000 ppm). The highest concentration after 1 year was greater than 10,000 ppm, measured in Aber Benoit and Loc Majan Cove. It is expected that pollution here may last 10 years. Decontamination was more rapid in areas exposed to wind and wave action, slower in sheltered sections of the coastline, marshes and abers. Pockets of oil remain in areas where oil was deposited during very high tides and where oil was buried by deposited sand. A table of vulnerability lists type of coast and sediment characteristics, method of pollution, factors affecting self-cleaning and human cleaning, and probable duration of pollution. (Cassar-FRC)
W81-02808

DISTRIBUTION OF ACTIVATION PRODUCTS FROM BARSEBACK NUCLEAR POWER PLANT (SWEDEN) IN THE MARINE ENVIRONMENT. TEMPORAL AND SPATIAL VARIATIONS AS ESTABLISHED BY SEAWEED,
Lund Univ. (Sweden), Dept. of Radiation Physics.
S. Mattsson, R. Finck, and M. Nilsson.
Environmental Pollution (Series B), Vol 1, No 2, p 105-115, 1980. 5 Fig, 1 Tab, 7 Ref.

Descriptors: *Nuclear powerplants, *Aquatic plants, *Radioisotopes, Bioindicators, Path of pollutants, Nuclear wastes, Seaweeds, Metals, *Sweden, Phaeophyta, Absorption, Marine plants.

The brown seaweeds, Fucus vesiculosus and Fucus serratus, were used as bioindicators to study the path of radionuclides discharged into the marine environment from a nuclear power plant on the Swedish coast. The degree of uptake per activity unit is ordered as follows: Mn54, Co58, Co60, and Zn65 greater than Ag110 greater than Cr51. Half lives of Co58, Co60, Mn54, and Zn65 were close to 60 plus or minus 15 days during the summer. About 85-80% of the radioactive material followed the northbound water stream and 10-15%, the southbound stream. An equation was developed relating the activity with distance north of the power plant outfall. (Cassar-FRC)
W81-02815

STUDIES ON THE PHOTOCHEMICAL DECOMPOSITION OF ORGANOMERCURIALS--METHYLMERCURY(II) CHLORIDE,
Yokohama National Univ. (Japan). Inst. of Environmental Science and Technology.
M. Inoko.
Environmental Pollution (Series B), Vol 2, No 1, p 3-10, January, 1981. 4 Fig, 1 Tab, 3 Ref.

Descriptors: *Mercury, *Chemical degradation, Degradation(Decomposition), Organomercury compounds, Ultraviolet radiation, Path of pollutants, *Methylmercury, Chemical reactions, Radiation.

Aqueous solutions of methyl mercuric chloride (10, 100, and 1000 micrograms per liter) were irradiated with ultraviolet light to determine the reaction products and kinetics. The initial decomposition reaction formed methyl and mercury chloride free radicals, which in turn produced ethane, mercurous chloride, methyl chloride, and metallic mercury. The reaction followed first-order kinetics, with a reduction rate constant of 0.6 per hour. This laboratory-derived data must be extrapolated cautiously to a natural aquatic environment, because the many other constituents present in natural systems could affect results. (Cassar-FRC)
W81-02816

IMPACT OF A COMBINED SEWER OVERFLOW ON THE ABUNDANCE, DISTRIBUTION, AND COMMUNITY STRUCTURE OF SUBTIDAL BENTHOS,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W81-02820

CHEMICAL TREATMENTS OF SOIL TO DECREASE RADIOSTRONTIUM LEACHABILITY,
Oak Ridge National Lab., TN. Environmental Science Div.
For primary bibliographic entry see Field 5G.
W81-02826

THE UPTAKE OF LEAD AND COPPER BY SUBMERGED AQUATIC MACROPHYTES IN TWO ENGLISH LAKES,
Westfield Coll., London (England). Dept. of Botany and Biochemistry.
R. P. H. Welsh, and P. Denny.
Journal of Ecology, Vol 68, No 2, p 443-455, July, 1980. 2 Fig, 8 Tab, 28 Ref.

Descriptors: *Copper, *Lead, *Metals, *Aquatic plants, Plants, Sediments, Translocation, Heavy metals, *Lakes, Path of pollutants, Sorption, Ullswater Lake, Coniston Lake, Mine wastes, Water pollution sources, England.

Lead and copper uptake of 9 taxa of submerged aquatic macrophytes was studied in 2 English lakes, Ullswater and Coniston Water, both dimictic, temperate, oligotrophic-mesotrophic types. Mining of lead, zinc, and copper was begun about 1700 AD and continued to the present century. Mine seepage water still flows into these lakes. Lead and copper levels were 10-40 micrograms per cu dm in inflowing rivers and 0.5-5 micrograms per cu dm in the lake water. Sediment metal levels were higher and varied with site. Highest Pb level was 41,000 micrograms per gram dry weight; highest Cu level, 1500 micrograms per gram dry weight. Highest metal contents of plants were (in micrograms per gram dry weight): roots, Pb 1000 and Cu 720; shoots, Pb 1200 and Cu 510. It is believed that plants adsorb lead directly from the water, since some plants not rooted in the sediment took up lead. Copper uptake appears to be mainly from the roots with translocation to the shoots. Some absorption from water also can occur. (Cassar-FRC)
W81-02827

THE EFFECT OF BEEF FEEDLOT RUNOFF ON THE NITRATE-NITROGEN CONTENT OF A SHALLOW AQUIFER,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
R. V. Terry, W. L. Powers, R. V. Olson, L. S. Murphy, and R. M. Rubison.
Journal of Environmental Quality, Vol 10, No 1, p 22-26, January-March, 1981. 7 Fig, 3 Tab, 16 Ref.

Descriptors: *Aquifers, *Nitrates, *Feedlot runoff, Groundwater pollution, Water quality, Water analysis, Nitrogen, Farm wastes, Statistical analysis, Fluctuations, On-site investigations, *Kansas, Great Plains, Deep wells, Shallow wells.

The effects of different application rates of beef feedlot runoff on the nitrate-nitrogen levels of a shallow aquifer were evaluated in a subhumid region of the Great Plains of Kansas. Five application rates (0.0, 2.5, 5.1, 7.6 and 10.2 cm) were used in a randomized block design over 3 blocks. Samples of lagoon water were applied whenever precipitation produced sufficient runoff so that the lagoons had to be emptied. Every 3 months, water samples from a shallow and a deep well in each plot were collected and analyzed for nitrate-nitrogen. Statistical and graphical analysis of the data revealed that the nitrate-nitrogen levels in the shallow well of block 3 were as high as 46 milligrams/liter. Results from this well were also extremely variable. When the means from 12 quarters were statistically analyzed, only one significant treatment was found, in the seventh quarter. In most of the quarters, when the application rates were high, the lowest nitrate-nitrogen levels occurred in the aquifer. Parallel fluctuations were found in the nitrate-nitrogen levels using the dual well system. These findings suggested that some variations in nitrate-nitrogen levels stemmed from regional factors and not only from applied treatments. (Geiger-FRC)
W81-02828

GROUNDWATER CONTAMINATION POTENTIAL AT 21 INDUSTRIAL WASTE-WATER IMPOUNDMENTS IN OHIO,
Environmental Protection Agency, Columbus, OH Groundwater Div.
R. B. Stein, and J. A. Noyes.
Ground Water, Vol 19, No 1, p 70-80, January-February, 1981. 1 Fig.

Descriptors: *Groundwater pollution, *Industrial wastes, Water pollution sources, *Wastewater lagoons, Impoundments, Watersheds(Basins), Water table, Water sources, Groundwater basins, Aquifers, Water pollution, Water management(Applied), *Ohio.

Data are reported which deal with the current and potential contamination of groundwater sources at 21 industrial waste-water impoundments in Ohio. These 21 impoundment sites were selected by the House Subcommittee as having a high potential for contaminating local ground-water resources, as they are located in close proximity to the tops of highly permeable aquifer systems, thus allowing leakage or direct infiltration of wastes into the ground water; the waste waters in these impoundments may contain chemical substances classified as hazardous; there are no artificially placed barriers or liners beneath these impoundments; the sites are within one mile of a potential water supply well; and a very small percentage of industrial impoundments nationwide are being monitored for ground-water quality effects. These 21 industrial complexes include chemical companies, steel corporations, asphalt companies, incineration plants, a scrap lead plant, and other industrial classifications. The results of individual studies conducted at each of the impoundment sites are presented. (Baker-FRC)
W81-02841

WASTE IMPOUNDMENT ASSESSMENT IN THE STATE OF INDIANA,
SCS Engineers, Covington, KY.
J. J. Walsh, D. P. Gillespie, F. J. Schauf, and L. R. Silka.
Ground Water, Vol 19, No 1, p 81-87, January-February, 1981. 2 Fig, 9 Tab.

Descriptors: *Groundwater pollution, *Industrial wastes, Water management(Applied), Water pollution, Aquifers, Groundwater basins, Water sources, Water table, *Indiana, Watersheds(Basins), Impoundments, Water pollution sources, *Wastewater lagoons.

A study was made of waste impoundment in the state of Indiana for the purpose of inventorying waste impoundments located within the state and rating each waste impoundment on the basis of its ground-water contamination potential. The data that was gathered indicated that waste impoundments do possess high contamination potentials. One potential problem is the fact that the average depth to ground water at impoundment sites was only 13 ft, and about 20% of the impoundments were located on top of sand and gravel or limestone. In addition, 1,781 sites (94%) were located within 1 mile of water supplies; and 95 of these (5%) were located within 600 ft upgradient from drinking water wells. It is suggested that concrete examples of pollution of groundwater due to the surface impoundment of wastes will be reported as the use of the groundwater resources expands and new aquifers are tapped for use. (Baker-FRC)
W81-02842

BRINE POLLUTION AT FRESNO - TWENTY-SIX YEARS LATER,
K. D. Schmidt, J. A. Krancher, and G. Bisel, Jr.
Ground Water, Vol 19, No 1, p 12-19, January-February, 1981. 3 Fig, 4 Tab, 7 Ref.

Descriptors: *Brines, *Groundwater pollution, *Pollutants, Saline water, Ice-brine systems, Subsurface waters, Aquifers, Groundwater resources, Saline water intrusion, Water management(Applied), Chlorides, Halides, *Fresno, California.

In the early 1950's a case of groundwater pollution by chloride seeping into the water from pits and wells used for the disposal of waste waters at a Southern Pacific Railroad yard was reported. After the source of the pollution was identified, steps were taken to correct the situation. This paper reports on the situation as it stands now, 26 yr after the initial reports of the pollution. The point source of the pollution was an ice plant and water softening plant on the railroad yard. Discharge was stopped in 1953. In the late 1970's a high chloride content was still detectable in the ground water downgradient of the yard. The plume expanded both vertically and horizontally in the aquifer, from a volume of about 1,500 acre-feet in 1953 to 15,000 acre-feet in 1979. An inspection of chloride contents in water from specific wells in the late 1970's indicates that values from 150 to 175 mg/l were common immediately downgradient of the discharge site from the ice plant. One well producing water with a chloride content of 490 mg/l in the late 1970's was located about 1/2 mile from the former discharge site for the water softening plant. (Baker-FRC)
W81-02843

EVIDENCE FOR COMETABOLISM IN SEWAGE,
Cornell Univ., Ithaca, NY. Lab. of Soil Microbiology.
S. N. Jacobson, N. L. O'Mara, and M. Alexander.
Applied and Environmental Microbiology, Vol 40, No 5, p 917-921, November, 1980. 3 Tab, 21 Ref.

Descriptors: *Sewage bacteria, *Metabolism, *Herbicides, Model studies, Microbiological studies, Microbial degradation.

A method was developed to show cometabolism in models of natural ecosystems and to demonstrate cometabolism in sewage. The formation of metabolic products in high yield and the lack of incorporation of substrate carbon into cellular constituents are shown by the model. Samples of four C14 labeled herbicides (trifluralin, profuralin, fluchloralin, and nitrofen) were incubated with sewage aerobically and under discontinuous anaerobiosis for 88 days. Fresh sewage was added at intervals. In nonsterile sewage, products were formed from each of the herbicides. No products were formed in sterile sewage. Yield of recovered products was 87% for profluralin and more than 90% for fluchloralin and trifluralin. The number of products ranged from 6 for nitrofen to 12 for fluchloralin. When sewage microflora was concentrated 40-fold, the rate of conversion was greatly enhanced. Since the carbon substrate was not incorporated into the cells and the substrate was almost stoichiometrically converted to organic compounds, members of the microbial community were thought to be cometabolizing the test herbicides. (Small-FRC)
W81-02849

PERSISTENCE OF SPILLED OIL IN A TEXAS SALT MARSH,
Texas Univ. at Port Aransas. Marine Science Inst.
S. A. Macko, P. L. Parker, and A. V. Botello.
Environmental Pollution (Series B), Vol 2, No 2, p 119-128, 1981. 6 Fig, 19 Ref.

Descriptors: *Oil spills, *Coastal marshes, *Path of pollutants, Salt marshes, Water pollution sources, Oil pollution, Chemical properties, Tracking techniques, *Texas.

A crude oil spill at Harbor Island, Texas, was analyzed to determine the persistence of oil in a salt marsh system. There was a rapid loss of low molecular weight alkanes and more volatile aromatics. Concentrations of higher molecular weight n-alkanes (greater than C22) and of the alkyl-substituted naphthalenes and phenanthrenes de-

creased slowly to background levels. Over the 24-month period of the study, only slight differences were noted in the carbon isotopic composition of the whole crude extract when compared with original oil. The isotopic ratio was quite stable, which is indicative of its value for the tracking of petroleum pollutants. Concentration decreases were extrapolated to indicate that baseline levels will not be achieved until another five years. The spill investigated was a small spill (377 barrels of Brega crude) under harsh conditions. The possible longterm effects of a larger spill could be much more severe. (Small-FRC)
W81-02857

FATE OF CHROMIUM IN A TRIBUTARY OF THE IRAJA RIVER, RIO DE JANEIRO,
Universidade Federal do Rio de Janeiro (Brazil). Inst. de Biofisica.
W. C. Pfeiffer, M. Fiszman, and N. Carbonell.
Environmental Pollution (Series B), Vol 1, No 2, p 117-126, 1980. 2 Fig, 3 Tab, 18 Ref.

Descriptors: *Plating industry, *Chromium, *Industrial wastes, *Path of pollutants, Rio de Janeiro, *Brazil, Guanabara Bay, Iraja River, Water analysis, Heavy metals, Metals, Water pollution sources, Adsorption, Sediments.

Chromium released by an elctroplating industry into a tributary of the Iraja River, Rio de Janeiro, was determined in water, bottom sediments, and suspended particles during seven months at five stations. The average monthly Cr release was 537 kg, with concentrations varying from 370 to 4482 mg per ml. Hexavalent Cr represented 87% and trivalent, 13%. Total Cr concentrations in water dropped rapidly with distance from the outfall, from a mean of 54 and 80 ppm at the two closest stations to 6 and 0.23 ppm respectively, 300 and 600 meters downstream. Upstream levels were 0.14 ppm. Mean sediment samples varied from 1420 ppm Cr upstream to 24820 and 54300 ppm near the outfall and 5440 and 1700 ppm further downstream. Total Cr levels in suspended particles were 2210 ppm upstream, 15260 and 61070 near the outfall, and 27370 and 18620 downstream. The highest single Cr level was 227000 ppm in a suspended particle sample closest to the outfall. At 150 meters from the effluent release point, hexavalent Cr was predominant. At the station 300 meters downstream, domestic sewage entered the river, producing reducing conditions and a higher proportion of trivalent Cr. (Cassar-FRC)
W81-02865

DETECTION OF DIMETHYLNITROSAMINE AND DIETHYLNITROSAMINE IN MUNICIPAL SEWAGE SLUDGE APPLIED TO AGRICULTURAL SOILS,
Wright State Univ., Dayton, OH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W81-02866

RELATIVE DEGRADATION RATES OF NTA, EDTA AND DTPA AND ENVIRONMENTAL IMPLICATIONS,
Princeton Univ., NJ. Dept. of Geological and Geophysical Sciences.
J. L. Means, T. Kucak, and D. A. Crerar.
Environmental Pollution (Series B), Vol 1, No 1, p 45-60, 1980. 4 Fig, 2 Tab, 46 Ref.

Descriptors: *Biodegradation, *Nitrilotriacetic acid, Ethylenediaminetriacetic acid, Diethylenetriaminepentaacetic acid, Chelation, *Heavy metals, Degradation(Decomposition), *Path of pollutants, Chemical reactions, Water pollution sources, Environmental effects, Organic compounds.

Chelating agents in the environment are undesirable, even at very low concentrations, because they solubilize and promote the transport of toxic and radioactive heavy metals in the ground and in natural waters. This study measured biodegradation rates of nitrilotriacetic acid (NTA), ethylenediaminetetraacetic acid (EDTA), and diethylenetriaminepentaacetic acid (DTPA) under different chemical conditions. Biodegradation rates decreased in the order NTA>EDTA = DTPA. Total degradation rates were DTPA>EDTA>NTA over the short term and NTA = DTPA>EDTA over the long term. Photolysis was noticeable in DTPA. Degradation rates decreased with decreasing oxidation-reduction potential and increased with addition of nutrients. After 173 days, total degradations of the three chelates were: greater than 99% for NTA and DTPA, and 92-99% for EDTA. The author suggests that chelates be destroyed by thermal or chemical means such as ozonation prior to discharge into the environment to prevent the danger of heavy metal mobilization. (Cassar-FRC)
W81-02868

ACID LAKES FROM NATURAL AND ANTHROPOGENIC CAUSES,
Academy of Natural Sciences, Philadelphia, PA. Div. of Limnology and Ecology.
R. Patrick, V. P. Binetti, and S. G. Halterman.
Science, Vol 211, No 4481, p 446-448, January 30, 1981. 7 Fig, 26 Ref.

Descriptors: *Coals, *Acidic water, *Lakes, *Acid rain, Water pollution sources, Water pollution effects, Fuels, Burning, Air pollution, Oil, Humic acids, Limnology.

Although the total amount of coal used in the U.S. has not significantly increased since 1920, changes in use patterns and pollution technology have altered the nature and quantity of stack emissions. This situation has produced acid rains and increasing acidity in many lakes in the northeastern U.S. Factors contributing to more acid emissions from fossil fuel burning are: (1) increase in the proportion of coal consumed by utilities, (2) gradual increase in use of fly ash precipitators, which remove the neutralizing effect of ash upon sulfur and nitrogen oxides, (3) the fact that sulfur scrubbers are only required on coal-burning plants built since 1975, (4) increase in the height of stacks, which introduces emissions high into the atmosphere where they can be readily transported for long distances (5) use of hotter combustion flames and resultant increase in nitrogen oxides emitted since 1975, (6) increase in use of petroleum in utilities and transportation where emissions are not controlled. Aquatic life in naturally acid lakes does not appear to suffer greatly from increases in acidity because the high humate content tends to chelate toxic metals released by the acid. However, lakes without this protective effect show more serious ecological disturbances. (Cassar-FRC)
W81-02870

BIODEGRADATION OF CHEMICALS OF ENVIRONMENTAL CONCERN,
Cornell Univ., Ithaca, NY. Dept. of Agronomy.
M. Alexander.
Science, Vol 211, No 4478, p 132-138, January 9, 1981. 1 Fig, 3 Tab, 91 Ref.

Descriptors: *Biodegradation, *Organic compounds, *Microorganisms, Chemical reactions, Persistence, Pesticides, Microbial degradation, Chemicals, Water pollution sources, *Path of pollutants, Environmental effects, Cometabolism, Chelation, Ecology, Reviews, Resistance, Enzymes, Soil contamination.

Microbial activity is the major process in complete degradation, or mineralization, of organic compounds such as pesticides in water and soil. This literature review describes the mechanisms of biological degradation, including cometabolism, and the toxic intermediates often formed from relatively innocuous precursors, e.g., methyl Hg from inorganic Hg in sediments. One table lists 16 types of reactions for transformation of environmentally important chemicals. Examples are dehalogenation (DDT), epoxidation (heptachlor), and sulfur oxidation (aldicarb). A second table lists 13 types of reactions for cleavage of organic chemicals. Examples of such chemicals are esters (malathion, phthalates) and S-S compounds (thiram). A third table shows examples of seven conjugation reactions involving, not degradation, but transformation. Examples are methylation of pentachlorophenol and N-nitrosation of dimethyl amine. Recalcitrant molecules, or molecules resistant to degradation (some synthetic polymers, pesticides, chlorinated aromatics, etc.) are discussed. These compounds may be esthetically undesirable, undergo biomagnification in the food chain, be transported in waters, and be very difficult to remove from the environment. Reasons for resistance to degradation are absence of oxygen in the medium, structure of the molecule, absence of any suitable organism or enzyme, low temperature, and complexing. (Cassar-FRC)
W81-02871

GLOBAL TRANSPORT OF ORGANIC POLLUTANTS: AMBIENT CONCENTRATIONS IN THE REMOTE MARINE ATMOSPHERE,
Texas A and M Univ., College Station. Dept. of Chemistry.
E. Atlas, and C. S. Giam.
Science, Vol 211, No 4478, p 163-165, January 9, 1981. 1 Fig, 2 Tab, 26 Ref.

Descriptors: *Enewetak Atoll, *Path of pollutants, *Organic compounds, Polychlorinated biphenyls, Air pollution, Baseline studies, Pesticides, Pacific Ocean, Water pollution sources, Oceans, Plasticizers, Chlorinated hydrocarbon pesticides, DDE, Chlordane, Dieldrin.

The levels of selected organic pollutants present in rain and air of Enewetak Atoll, North Pacific Ocean, an area remote from human and industrial activity, were measured in April to August 1979, to determine an ambient or minimum worldwide pollutant level. Some averaged pollutant concentrations in rainfall (in nanograms per liter) were as follows: polychlorinated biphenyls, less than 0.6; hexachlorobenzene, less than 0.03; alpha-hexachlorocyclohexane, 3.11; gamma-hexachlorocyclohexane, 0.51; chlordane, dieldrin, and DDE, less than 0.02; di-n-butyl phthalate, 21; and di(2-ethylhexyl)phthalate, 55. Atmospheric residence times showed that rain was not the only factor involved in removing pollutants from the air. Vapor phase deposition into the sea surface may be the controlling factor. (Cassar-FRC)
W81-02872

RELATIONSHIP BETWEEN HETEROTROPHIC BACTERIA AND PHYTOPLANKTON IN LAKE MERGOZZO AND LAKE BIWA,
Kyoto Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 2H.
W81-02881

PHOSPHORUS AND NITROGEN IN THE MEDITERRANEAN SEA: BUDGETS AND POTENTIAL FERTILITY. (LE PHOSPHORE ET L'AZOTE EN MER MEDITERRANEE, BILANS ET FERTILITE POTENTIELLE),
Station Marine, Villefrance-sur-Mer (France). Lab. de Physique et Chimie Marines.
J. P. Bethoux.
Marine Chemistry, Vol 10, No 2, p 141-158, 1981. 6 Fig, 1 Tab, 21 Ref.

Descriptors: *Phosphorus, *Nitrogen, *Mediterranean Sea, Nutrients, Water pollution sources, Cycling nutrients, Path of pollutants.

Terrestrial discharges of phosphorus and nitrogen into the Mediterranean Sea are considered along with the calculated values of water fluxes. Only low concentrations of phosphorus are found in the surface layers of the water. The phosphorus cycle in the Mediterranean is characterized by the transfer of the terrestrial and Atlantic influxes from the surface to the intermediate and deep layers. The geographic distribution of terrestrial discharges is extremely asymmetric, with vertical movements of water masses in specific areas inducing an important hydrologic recycling of the phosphorus. The potential fertility is estimated from the local surface phosphorus flows and from the hydrologic recycling. The nitrogen budget in the Mediterranean should be comparable to that of phosphorus, as the geographical variations of the nitrate concentrations in the deep waters and the distribution of terrestrial discharges are similar. However, the relatively low values of terrestrial discharges of

nitrogen that have been proposed do not allow a balance of this nutrient unless a high concentration is introduced in the Atlantic surface waters. (Baker-FRC)
W81-02891

HYDROCARBON-UTILISING MICRO-ORGANISMS FROM DONA PAULA BAY, GOA,
National Inst. of Oceanography, Panaji (India).
N. B. Bhosle, and S. Mavinkurve.
Marine Environmental Research, Vol 4, No 1, p 53-58, 1980-81. 4 Tab, 14 Ref.

Descriptors: *Microorganisms, *Bacteria, *Organic compounds, Oil pollution, *Hydrocarbons, Biodegradation, Water pollution treatment, Water pollution sources, Path of pollutants, Marine microorganisms, Yeasts, Oil spills, Goa, Dona Paula Bay, *India.

Twenty-three strains of bacteria and one yeast were isolated from water and sediment samples in Dona Paula Bay, Goa. Most predominant were Vibrio and Pseudomonas. These were grown on a variety of hydrocarbons and hydrocarbon mixtures--kerosene, motor oil, Arabian Sea crude, furnance oil, aviation turbine fuel, raw naphtha, gasoline, diesel, tar, n-pentane, n-hexane, cyclohexane, n-heptane, benzene, xylene, toluene, naphthalene, and anthracene. Bacillus, Candida, and Arthrobacter sp. utilized the greatest number of hydrocarbon materials. Arabian Sea crude and kerosene supported the growth of most of the isolates. Pentane, benzene, naphthalene, and anthracene accelerated growth of most of the microorganisms. (Cassar-FRC)
W81-02893

NON-RADIOLOGICAL ENVIRONMENTAL IMPLICATIONS OF NUCLEAR ENERGY,
Biswas and Associates, Oxford (England).
For primary bibliographic entry see Field 5C.
W81-02895

USE OF SYNTHETIC DETERGENTS IN MALAYSIA,
Malaya Univ., Kuala Lumpur (Malaysia).
For primary bibliographic entry see Field 5C.
W81-02896

HEALTH HAZARDS AND POLLUTION FROM OPEN DRAINS IN A NIGERIAN CITY,
Ibadan Univ. (Nigeria). Dept. of Preventive Medicine and Social Medicine.
M. K. C. Sridhar, P. A. Oluwande, and A. O. Okubadejo.
Ambio, Vol 10, No 1, p 29-33, 1981. 4 Fig, 4 Tab, 20 Ref.

Descriptors: *Public health, *Waste water(Pollution), *Domestic wastes, Diseases, Drains, Sewage disposal, Water pollution sources, Ibadan, *Nigeria, Wastes, Municipal wastes, Sewage, Water quality, Cities, Microbiology, Coliforms, Parasitism, Human diseases.

Wastewater from kitchens, bathrooms, and laundries in the city of Ibadan, Nigeria, is commonly carried in open drains, which are a source of environmental pollution and health hazards. Samples of waste water were collected in areas of high-, medium-, and low-density population. Most severe pollution was seen in the samples from the most crowded sections of the city, 350-430 persons per hectare. Ranges of results were as follows: pH, 6.4-7.5; turbidity, 50-1000 Fermazin units; total solids, 112-11,544 mg per liter; suspended solids, 20-1,150 mg per liter; 4 hour permanganate value, 25-61.9 mg per liter; BOD, 30-980 mg per liter; dissolved oxygen, 0-0.6 mg per liter; NH3, 20-800 mg per liter; mean total coliforms, 18,000,000 per 100 ml; and fecal coliforms, 800-16,000 per 100 ml. Sediment samples (500 g) from one sandy open drain showed an average of 3,400 Ascaris sp. ova and 300 hookworm larvae. Waste water samples contained a variety of pathogens and parasites: Staphylococcus aureus, fecal coliforms, Trichomonas sp., Balantidium coli, Giardia intestinalis, Entamoeba histolytica, Candida albicans, Ascaris sp. ova, larvae of hookworm Ancylostoma sp., miracidia of Schistosoma sp., and Strongyloidess sp. Although waste water drains are capable of self-purification after flowing 16-40 km, the drains of Ibadan enter streams before much improvement in quality occurs. This situation produces severe stream and groundwater pollution. (Cassar-FRC)
W81-02900

5C. Effects Of Pollution

HYDROCHEMICAL AND GEOPHYSICAL INVESTIGATION OF THE EFFECTS OF FLY-ASH DISPOSAL ON GROUNDWATER,
Wisconsin Univ.-Madison. Water Resources Center.
D. S. Cherkauer, and W. F. Kean.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-197592,Price codes: A05 in paper copy, A01 in microfiche. Technical Completion Report WIS WRC 80-12, 1980. 85 p, 32 Fig, 7 Tab, 43 Ref, 1 Append. OWRT-A-077-WIS(1), 14-34-001-8053, 9053.

Descriptors: *Groundwater, *Chemical wastes, *Water pollution effects, *Fly ash, *Leachate, *Landfills, Pollutant identification, Geophysics, Wisconsin, Waste disposal, Earth fill, Solid wastes, Water pollution souces, Water pollution, Water quality, Calcium, Magnesium, Sodium, Potassium, Iron, Manganese, Nickel, Zinc, Inorganic compounds, Research and development, Analytical techniques.

The effects of landfill disposal of fly ash on groundwater and methods useful to monitoring such impact were investigated. Hydrochemical and geophysical monitoring of a fly ash landfill site in Ozaukee County, Wisconsin and related laboratory experiments were carried out. The landfill disposal method is the only method presently used in Southeastern Wisconsin. Landfill disposal of fly ash allowed generation of an acidic leachate highly concentrated with Ca, Mg, Na, K, sulfate, and several metals (Fe, Mn, Ni, Zn). Fly ash disposal in contact with an unconfirmed sand aquifer resulted in development of a traceable leachate plume in the aquifer. The plume contained water severely contaminated with Ca, Mg, and sulfate, and bicarbonate concentrations were high due to dissolution of the dolomite-rich sand. Leachate contamination was released in a pronounced 'first flush' pattern immediately after disposal of new ash. Reactions between the carbonate-rich aquifer sand, marsh peat, and the leachate rapidly ameliorated the contamination effects. Heavy metals were, in general, undetected outside the fill boundaries. Major ions (except ca and bicarbonate) were rapidly reduced in concentration downflow. Electrical resistivity methods were useful for identifying the extent of leachate contamination in a shallow aquifer and for tracing its migration and seasonal changes. (Zielinski-IPA)
W81-02651

MECHANISMS BY WHICH ACID PRECIPITATION PRODUCES EMBRYONIC DEATH IN AQUATIC VERTEBRATES,
Cornell Univ., Ithaca, NY.
F. H. Pough.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198392, Price codes: A02 in paper copy, A01 in microfiche. Center for Environmental Research, Cornell University, Completion Report. March, 1981. 13 p, 4 Tab, 21 Ref. OWRT-A-077-NY(2), 14-34-0001-7068, 8034, 9034, 0134.

Descriptors: Acid precipitation, Embryology, *Amphibians, Experimental studies, *Acid rain, *Toxicity, Fish, Frogs, Ponds, *Lakes, Embroyonic growth stage, Hydrogen ion concentration, Ambystoma jeffersonianum, Ambystoma maculatum, Rana sylvatica, Xenopus laevis, Teratogenesis.

Fourteen species of amphibians show a general similarity in their tolerance of acid media during embryonic development. More than 85% mortality is produced by pHs of 3.7 to 3.9 and more than 50% mortality occurs at pHs of 4.0 or less. Similar values have been reported for fishes. The sensitivity of amphibian embryos to acidity is greater in late stages of their development than it is during the initial cleavage of the embryos. The teratogenic effects of acidity appear to be the result of damage to the superficial tissues of the embryo. A similar response occurs in fish embryos. Because of the similarity of sensitivity and response to acidity of fishes and amphibians, the latter animals are suitable experimental models for investigations of the details of acid resistance. Controlled breedings of African clawed frogs (Xenopus laevis) indicated that the offspring of some pairs of parents were more resistant to acidity than those of other pairs. Wild populations of spotted salamanders (Ambystoma maculatum) breeding in some ponds in the Ithaca, New York, region have probably been exposed to increasingly acid conditions for the past three decades (10 or more generations). In the most acid ponds more than 70% of the embryos die before hatching. Despite the intensity and duration of this selection, it was not possible to demonstrate any difference in sensitivity to acidity between eggs collected from acidic and neutral breeding sites.
W81-02716

THE NITROGEN CYCLE IN THE DELAWARE RIVER,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
R. B. Tiedemann, T. J. Tuffey, J. V. Hunter, and J. Cirello.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198400. Water Resources Research Institute, Rutgers University Completion Report, February, 1981. 67 p, 12 Fig, 24 Tab, 10 Ref. OWRT-B-054-NJ(2), 14-31-0001-5091.

Descriptors: *Nitrogen cycle, *Nitrification, *Estuarine environment, Delaware, *Bacterial analysis, Bacteria, Estuaries, Environment, River systems, Rivers, Nitrogen fixing bacteria, Aquatic bacteria, Aquatic life, Aquatic populations, Water quality, Nitrogen compounds, Nitrites, Nitrates, Imparied water quality, Water pollution effects, *Delaware River.

The research scope was divided into two phases: (1) a review of existing literature on the estuary concerning nitrification; (2) transfer of ammonia and nitrate across the mud-water interface. The first phase was expanded to include studies of the role of nitrification inhibition and particulates. Indirect evidence (nitrogen species data) obtained from U.S. Environmental Protection Agency Storet data indicated that significant nitrification occurs within the estuary. These observations were confirmed by the present study. Number counts of nitrifying organisms indicated that the changes observed in the ammonia-nitrogen, nitrite-nitrogen, and nitrate-nitrogen concentrations could be attributed to the organisms present, due to the long retention times. Nitrification was observed to proceed at a maximum rate during June-October and a zone of nitrification inhibition was observed in the vicinity of the city of Philadelphia. Two nitrifying regions were identified: one in the upper estuary, one in the lower, with the latter shifting upstream during warm water months. Of the chemical and microbiological parameters measured, only pH, dissolved oxygen and suspended solids varied considerably with estuary location and/or depth. (Zielinski-IPA)
W81-02727

A MODEL APPROACH TO ESTIMATING THE EFFECTS OF ANTHROPOGENIC INFLUENCES ON THE ECOSYSTEM OF LAKE BAIKAL,
Rostov-on-Don State Univ. (USSR). Inst. of Mechanics and Applied Mathematics.
A. B. Gorstko, Y. A. Dombrovskiy, V. V. Selyutin, F. A. Surkov, and A. M. Nikanorov.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet

Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, Michigan. Environmental Protection Agency Report 600/9-80-033, July 1980. p 71-84, 4

Descriptors: *Water pollution sources, *Ecosystems, Experimental data, Prediction, Water use, Surface runoff, Precipitation, Lake morphology, *Model studies, Lake Baikal, *Russia.

At present, anthropogenic effects on the ecosystem of Lake Baikal are minimal. Possible effects can be judged using models for long-term prediction. The lake is used as a source of water for consumption, the culture and harvesting of fish and for recreation. The major pollutant sources are surface runoff and atmospheric precipitation. Numerical hydrodynamic calculations and field observations of current speed and direction were used in the modeling of the hydrochemical regime. The basis of the models for the dynamics of the concentrations of substances entering the lake is the equation of turbulent diffusion of a non-conservative impurity. Two groups of equations are used to develop a model based on the dynamic balance method, one group reflecting the productive nature of the system and the other the dynamic nature. In addition to its primary function as a predictive instrument, the model can act as a connecting link between various branches of limnologic study of Lake Baikal, and indicate areas where information is incomplete. (Brambley-SRC)
W81-02734

A REVIEW OF SOME METHODS AND PARAMETERS USED IN ASSESSING EFFECTS OF WATER INTAKES ON FISH POPULATIONS,
Michigan Univ., Ann Arbor. School of Natural Resources.
R. L. Patterson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, MI. EPA Report 600/9-80-033, July, 1980, p 237-251, 1 Fig, 16 Ref.

Descriptors: *Fish populations, *Mortality, *Intakes, *Entrainment, *Population dynamics, Aquatic populations, Larvae, Aquatic habitats, Environmental effects, Food chains.

The direct effects of water intakes on fish populations consist of entrainment, and impingement. Direct effects upon sections of the aquatic habitat may be triggered by withdrawal of excessive quantities of water, which may affect recruitment or survival of the species inhabiting the area. Indirect effects include: imbalance in food chains due to size or species selectivity in cropping, and the loss in new recruits in subsequent years due to cropping of individuals in the present year. Factors important in assessing the effects of water intakes include: historical review, mortality rates of entrained larvae, size distribution of entrained larvae, total number of entrained larvae, total number and size distribution of impinged individuals, percent reduction in size or age classes due to entrainment and impingement, and the vulnerability of larval populations to entrainment. An assessment of direct effects is complicated by the need to obtain larval production and natural mortality estimates as well as estimates of standing crops of other size classes, and the differential impact that a particular water intake may exert if it selectively crops size classes, and the implications of this differential cropping of size classes upon the percent reduction in the population. (Moore-SRC)
W81-02742

A SPATIALLY-SEGMENTED MULTI-CLASS PHYTOPLANKTON MODEL FOR SAGINAW BAY, LAKE HURON,
Environmental Research Lab.-Duluth, Grosse Ile., MI. Large Lakes Research Station.
V. J. Bierman, Jr., and D. M. Dolan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, Aug 27-30, 79, Bloomfield Hills, MI. EPA Report 600/9-80-033, Jul 80, p 343-365. 16 Fig, 1 Tab, 5 Ref.

Descriptors: *Phytoplankton, *Eutrophication, *Model studies, *Mathematical models, *Lake Huron, Water quality, Water chemistry, Zooplankton, Nutrients, Phosphorus, Nitrogen, Silicon, Chlorophyll, Chloride, Water pollution.

The principle water uses in Saginaw Bay include municipal and industrial water supply, waterborne transportation, recreation, commercial fishing, and waste assimilation. These uses are severly impacted by the considerable quantities of waste discharges and runoff to the bay. The purpose of the modeling effort was to develop a deterministic phytoplankton simulation model that could describe the cause-effect connection between external nutrient loading and phytoplankton growth in Saginaw Bay. Analyses were conducted for 22 different physical-chemical variables, including phosphorus, nitrogen, silicon, chlorophyll, chloride, temperature, and Secchi depth. Biological measurements included species identification and number concentrations for both phytoplankton and zooplankton. These field data are used to perform a preliminary calibration for the phytoplankton modeling effort. The field data indicate that there are large gradients in water quality among five spatial segments in Saginaw Bay. These gradients have a strong impact on the model development effect because it is difficult to obtain a unified set of kinetics which can describe phytoplankton dynamics simultaneously in all five segments. (Moore-SRC)
W81-02746

URBAN RUNOFF RECEIVING WATER IMPACTS: PROGRAM OVERVIEW AND RESEARCH NEEDS,
Municipal Environmental Research Lab., Edison, NJ. Storm and Combined Sewer Section.
R. Field, and R. Turkeltaub.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche. In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, Nov 26-28, 79, EPA Report EPA 600/9-80-056, Dec 80, p 8-30. 11 Fig, 4 Tab, 22 Ref.

Descriptors: *Storm runoff, *Storm wastewater, *Combined sewer overflows, *Urban runoff, Research priorities, Water pollution sources, Water pollution control, Dissolved oxygen, Pathogens, Nutrients, Aquatic life, Poisons, Water quality standards, Monitoring, High flow.

Uncontrolled stormwater and combined sewer overflows are a major cause of pollution of receiving waters. Data on the environmental impacts of urban stormwater and combined sewer overflow are being gathered by projects of the Storm and Combined Sewer Program of the EPA's Municipal Environmental Research Laboratory as a first step in developing control needs and a methodology to quantify pollutant stress and evaluate the impact in relation to receiving water standards and desired uses. Ongoing projects include studies on dissolved oxygen depletion with particular reference to sediment oxygen demand; pathogen concentrations; nutrients; aquatic biological communities; and toxic substances. Control methodology will be based on some site-specific factors, but general studies are valuable. They include projects to review case studies of documented receiving water impacts; to develop a methodology for defining criteria for wet-weather water quality standards; and to develop a user's manual/guidebook for wet-weather flow quality and quantity monitoring. (Brambley-SRC)
W81-02748

AN APPROACH FOR ASSESSING THE WATER QUALITY SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN URBAN LAKES,
Colorado State Univ., Fort Collins.
G. F. Lee, and R. A. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche. In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, EPA Report EPA 600/9-80-056, Dec 80, p 32-57. 6 Fig, 26 Ref.

Descriptors: *Urban runoff, *Eutrophic lakes, Phosphates, *Nutrients, *Contamination, Water pollution control, Eutrophication, Storm water, Water quality, Macrophytes, Dredging, Chemical precipitation, Nitrogen, Lakes, Urban lakes.

Increasing pressures are being placed on water pollution control agencies to manage water quality in urban lakes. A major problem to be overcome is the excess nitrogen and phosphorus which enter the lake from urban runoff. Since only 10-30% of the particulate phosphorus present in urban stormwater is likely to become available to affect algal growth, attention should be directed to the soluble orthophosphate component, yet most current stormwater drainage control programs are directed to particulate control. A study conducted by the Organization for Economic Cooperation and Development which models eutrophication can be used to describe the nutrient load-response relationships for the urban lakes and to estimate the magnitude of water quality improvement that will arise as a result of altering the nutrient loads in phosphorus limited urban lakes. Improved water quality may be achieved by: removal of debris and trash left by users of the area; control of macrophytes by herbicides or harvesting; dredging of sediment; and direct addition of alum to precipitate phosphate in incoming waters. (Brambley-SRC)
W81-02749

THE EFFECT OF URBAN STORMWATER RUNOFF ON THE WATER QUALITY OF LAKE JACKSON, FLORIDA,
Florida State Univ., Tallahassee. Dept. of Oceanography.
C. Byrne, C. R. Donahue, and W. C. Burnett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche. In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, EPA Report EPA 600/9-80-056, December 1980, p 58-71. 4 Fig, 2 Tab, 15 Ref.

Descriptors: *Urban runoff, Storm surges, *Storm runoff, *Lakes, *Hydrocarbons, Petroleum products, Particulate matter, Dissolved solids, Water quality, Water pollution sources, Water sheds, *Lake Jackson, Florida.

The presence of petroleum hydrocarbons in the stormwater runoff to the Meginniss Arm of Lake Jackson during a storm event was investigated and the concentration and forms of these hydrocarbons assessed as they move through the discharge channel and into the lake. Water grab samples were taken at intervals after the storm at four locations on 27 November, 1978. Dissolved and particulate hydrocarbon fractions were determined using gas-liquid chromatography. The dissolved hydrocarbon fraction ranged from 18-71 ppb, with a significant maximum 2 hours after the storm event. The total particulate hydrocarbon concentrations ranged from 37-16,365 ppb, with the maximum at the beginning of the storm, and a secondary maximum 2 hours into the storm. The presence of petroleum hydrocarbons is indicated by the low Carbon Preference Index (<1.5) and the occurrence of an unresolved hydrocarbon envelope in the chromatograms. Comparison of the runoff from this highly urban watershed with that from a primarily forest-agriculture watershed may make possible a separation of the biogenic and anthropogenic pollution sources. This information could contribute to determination of a mass balance for hydrocarbons in the lake. (Brambley-SRC)
W81-02750

A COMPARISON OF RAIN-RELATED PHOSPHORUS AND NITROGEN LOADING FROM URBAN, WETLAND, AND AGRICULTURAL SOURCES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. P. Glandon, F. C. Payne, C. D. McNabb, and T. R. Batterson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, EPA Report EPA 600/9-80-056, Dec 80, p 72-88. 4 Fig, 3 Tab, 14 Ref.

Descriptors: *Urban runoff, *Agricultural runoff, Phosphorus, Rainfall-runoff relationships, Nitrogen, *Skinner Lake, Indiana, *Lake Lansing, Michigan, *Nutrients, Watersheds, Limiting nutrients, Eutrophication, Lakes, Phytoplankton, Water pollution sources, Water pollution control, Lake Michigan basin.

To compare the watershed types with respect to the ability to maintain phytoplankton productivity in a lake throughout the summer, comprehensive watershed studies were conducted in Lake Lansing and Skinner Lake in the Lake Michigan drainage system from March to October, 1979. During that interval, large differences in storm-related nutrient loading were measured from urban, wetland, and agricultural sources. Eliminating runoff due to melt of the snow pack, it was found that rain-related discharge from the urban area studied was 0.578 kg total-P and 3.688 kg total-N per hectare. Rain induced runoff from marshes in the same drainage basin transported 0.023 kg total-P and 0.585 kg total-N per hectare. Rainfall of approximately the same amount caused runoff from agricultural land of 0.180 kg total-P and 5.965 kg total-N per hectare. Algae of both lakes were phosphorus limited; nitrogen was present in excess. Using constants from Nichols-Dillon relationships in the literature regarding phosphorus, phytoplankton biomass, and secchi disc transparencies, the urban input of phosphorus per hectare of drainage was sufficient to bring 0.96 ha-m lake water to undesirable algal bloom status. Similarly, marsh input per hactare would bring an estimated 0.04 ha-m into bloom. By the same calculation, storm-related agricultural runoff would result in 0.30 ha-m of lake water becoming undesirably rich in algae. Knowing the number of hectares in these types of catchment and the volume available in a particular lake for phytoplankton production, decisions regarding cost-effective treatment of rain-related discharge can be made. (Brambley-SRC)
W81-02751

IMPACTS OF STORMWATER RUNOFF ON A FLORIDA LAKE ECOSYSTEM: EFFECTS ON WATER QUALITY AND BIOTA,
Marine Environmental Sciences Consortium, Dauphin Island, AL.
E. C. Blancher, II.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, EPA Report EPA 600/9-80-056, December, 1980, p 90-114. 4 Fig, 11 Tab, 29 Ref.

Descriptors: *Lake Conway(FL), *Stormwater runoff, *Nutrients, Nitrogen, Phosphorus, *Mesotrophic lakes, Eutrophication, Algal growth, Zooplankton, Water pollution sources, Water quality, Storm seepage, Precipitation, *Florida.

The Lake Conway system is an interconnected series of three lakes with similar physical, chemical and biological features which vary in stormwater loadings and are relatively free of other pollution inputs. It is therefore suitable for studying the effect of stormwater on water quality and biota. Both nitrogen (2.6 g-N per sq. m per year) and phosphorus (0.22 g-P per sq m per year) inputs were within the range of loadings that leads to mesotrophic conditions. The major external sources of both elements were atmospheric inputs, stormwater runoff and subsurface seepage. Multivariate analysis of water quality data by discriminant analysis showed differences among the three lakes of the Conway system. Seasonal trends in several water quality indicators varied concomitantly with changes in external nutrient loadings, especially with those from residential stormwater runoff. Those lakes that had a proportionately larger share of phosphorus loadings from stormwater runoff showed a degradation in water quality. Strong linear relationships were found between watershed area to lake area ratios and stormwater phosphorus loadings; stormwater phosphorus loadings and Secchi disk transparency; and chlorophyll a and total zooplankton numbers. Increased stormwater flow into the lakes is associated with decreased water quality, and larger algal and zooplankton populations. (Brambley-SRC)
W81-02752

THE ECOLOGICAL EFFECTS OF URBAN RUNOFF ON STREAM COMMUNITIES,
Tetra Tech, Inc., Lafayette, CA.
D. B. Porcella.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, EPA Report EPA 600/9-80-056, December 1980, p 147-166. 4 Fig, 5 Tab, 20 Ref.

Descriptors: *Urban runoff, *Storm runoff, *Ecological effects, *Ecosystems, *Stream biota, *Stream pollution, Streams, Evaluation, Aquatic plants, Macroinvertebrates, Monitoring, Water pollution sources, Water pollution control.

Materials in urban runoff impact streams in several specific and unique ways that distinguish those impacts from other linked systems. A literature review of the ecological effects of urban runoff on streams indicates a dearth of principles for evaluating the impact of urban runoff or any pollutant on streams, and a serious lack of studies that determine urban runoff impacts on communities of stream ecosystems. It can be concluded from the case studies that macroinvertebrates and periphyton seem to be effective for monitoring impulse impacts on streams; that diversity and biomass are often used for the analysis of monitoring data but they are not always adequately sensitive; and that water quality variables do not always reflect stream impacts directly but the biota must also be assessed. Consideration of three studies of ecological effects of storm runoff lead to the hypothesis that large scale variations and instabilities of stream pollutant input and concentration would result in lesser impact to stream communities than steady imputs. Time and space measurements of structurally and functionally defined biomass, photosynthesis, respiration, and diversity would be used to determine the ecological impact of the runoff loadings, leading to the development of management strategies. (Brambley-SRC)
W81-02754

ANALYSIS OF RECEIVING STREAM IMPACTS ON THE MILWAUKEE RIVER,
EcolSciences, Inc., Milwaukee, WI.
T. L. Meinholz.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December 1980. p 168-196, 16 Fig, 1 Tab.

Descriptors: *Combined sewers, *Storm sewers, *Model studies, *Combined sewer overflows, *Dissolved oxygen, Scour, Lake Michigan, Bottom sediment, Prediction, Evaluation, Water pollution control, Cost-benefit analysis, Coliforms, Monitoring, *Milwaukee River, Wisconsin.

Extensive monitoring and modeling efforts were performed to quantify the receiving water impacts of the combined sewers on the Milwaukee River, Milwaukee, Wisconsin. The models used were the EPA's SWMM and the Corps of Engineers' STORM models. The inflow of Lake Michigan into the river was a major difficulty in the modeling. Final model calibration using a linearly decreasing flux was found to match the continuous dissolved oxygen (DO) data generated during two years of record. Field monitoring showed that the cause of the large DO sags in the lower reaches of the river following runoff events are due to bottom sediments scoured out by the submerged combined sewer outfalls. The receiving water model was modified to include an expression which would predict the extent and duration of the scour action from the submerged outfalls. Long term simulations of DO and other parameters were calibrated and verified using the response of the river to a multitude of rainfall events. The use of this model network in the evaluation of possible actions for abating combined sewer overflows produced magnitudes of DO and fecal coliform impacts for each action using 20 yrs of rainfall record. Cost-benefit analyses were performed for: existing conditions; partial separation; complete separation; out of basin (storage-conveyance-treatment); end of pipe; and 100% combined sewer outflow removal. (Brambley-SRC)
W81-02755

URBAN STORMWATER IMPACTS ON RECEIVING STREAMS IN NORTH CAROLINA,
North Carolina Dept. of Natural Resources and Community Development, Raleigh. Div. of Environmental Management.
E. R. Brown, and R. S. Green.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-155426, Price codes: A99 in paper copy, A01 in microfiche.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, FL., Nov 26-28, 1979, EPA Report EPA 600/9-80-056, December, 1980. p 197-222, 11 Fig, 8 Tab, 15 Ref.

Descriptors: *Urban runoff, *Storm sewers, *Storm overflow sewers, *Stream degradation, *Stream biota, Water quality standards, Monitoring, Macroinvertebrates, Nutrients, Heavy metals, Aquatic animals, High flow, Suspended solids, Urban watersheds, Water pollution control, *North Carolina.

To determine the extent of water quality degradation in streams receiving urban stormwater runoff, selected streams were monitored in three of the larger urban areas within the state; Asheville, Raleigh, and Winston-Salem. The monitoring program involved physical/chemical sampling under both high (storm) and low streamflow conditions. Parameters sampled include pH, temperature, DO, five day BOD, COD, fecal coliform, ammonia-nitrogen, total Kjeldahl nitrogen, nitrite plus nitrate nitrogen, total phosphorus, iron, mercury, lead, zinc, copper, cadmium, chromium, nickel and solids. Biological sampling of aquatic benthic macroinvertebrates was conducted concurrently to further document water quality conditions. All of the urban streams exhibited extensive water quality problems. Physical/chemical sampling consistently revealed high pollutant concentrations for several parameters under high flow conditions. Notable problematic parameters included suspended solids, lead, and some nutrients. Several parameters were frequently present in high concentrations under low flow conditions also. Variations in pollutant concentrations from the different land use types were also observed. All of the urban streams monitored were found to be extensively biologically degraded. Populations of Diptera and Oligochaeta, pollution-tolerant organisms, averaged over 90% of the existing fauna. In contrast, control station population percentages of these organisms were a maximum of 15% of the fauna in the mountain stream, and 35% in Piedmont streams. Many intolerant groups were not just reduced in numbers in the urban streams; they were usually completely absent. Under present conditions, almost all urban streams will be unable to meet the 1983 water quality goals. Improvement of water quality conditions in these streams is dependent upon the development of programs to effectively manage the

entry of pollutants from urban land surfaces and unrecorded or intermittent point sources.
W81-02756

DISSOLVED OXYGEN IMPACT FROM URBAN STORM RUNOFF,
Sutron Corp., Arlington, VA.
T. N. Keefer, R. K. Simons, and R. S. McQuivey.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December 1980. p 223-244, 4 Fig, 2 Ref.

Descriptors: *Urban runoff, *Dissolved oxygen, *Storm runoff, *Water quality standards, Monitoring, Rainfall, Urban areas, Data processing, Water pollution sources, Statistical analysis.

Records from 104 water quality monitoring sites throughout the country were considered to determine whether a correlation exists between strength of dissolved oxygen (DO) deficit and the presence of rainfall and/or storm runoff in and downstream of urban areas. Daily data were obtained and processed for 83 of the sites. At 24 of the sites low DO correlated with flow, and at 18 sites with rainfall. This correlation was obtained by considering daily data for the entire water years, but did not occur every year. Oxygen levels of 5 mg/1 or less were not uncommon. Detailed hourly data analysis was made at 22 of the sites with high correlation between flow and DO deficit. Eleven of these would not meet a 5.0 mg/1 DO standard; six of the eleven would not meet the EPA-suggested standard of 2.0 mg/1 for 4 hr. The exact cause of the increase in DO deficit is not obvious in most cases. Violations of water quality standards appear to be infrequent. (Brambley-SRC)
W81-02757

THE IMPACT OF COMBINED SEWER OVERFLOWS ON THE DISSOLVED OXYGEN CONCENTRATION OF A SMALL STREAM,
Aalborg Univ., Denmark. Dept. of Environmental Engineering.
T. Hvitved-Jacobsen.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 245-259, 9 Fig, 9 Ref.

Descriptors: *Combined sewer overflows, *Dissolved oxygen, *Water pollution, Stream pollution, Storm waste water, Water quality, Storm runoff, Biochemical oxygen demand, Benthos, Organic matter, *Denmark, Jutland, Skravad Brook.

Towns of 1,000-10,000 inhabitants often must discharge municipal waste water and stormwater to a small stream with a flow of 50-500 1/sec. During intensive storms, the flow may be increased several hundred percent. The discharged water from combined sewers may be a potential source for undesirable impact on the dissolved oxygen in the stream. The different oxygen consumption processes in receiving streams were studied at four stations in Skravad Brook in Jutland, Denmark, during and after the passage of storm overflows. Two different effects on the dissolved oxygen concentration were observed in the stream: an immediate effect, and a delayed effect. The immediate effect is caused by degradation of the soluble biochemical oxygen demand fraction in the water and by direct absorption of organic matter by bottom invertebrates. A delayed effect is caused by degradation of the adsorbed colloidal and settling particulate matter. The delayed degradation may increase the respiration of the bottom about 100%. This delayed effect may last 12-24 hours after the discharge event. The oxygen consumption of the organic matter input to the stream by a storm overflow is spread over a long period compared to time of passage of the polluted volume. This effect appears to be essential for evaluation and design of sewage systems within urban areas. (Moore-SRC)
W81-02758

IMPACTS OF INTERMITTENT URBAN DISCHARGES ON RECEIVING WATERS,
Manhattan Coll., Bronx, NY.
J. L. Mancini.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 261-280, 8 Fig, 6 Tab, 6 Ref.

Descriptors: *Combined sewer overflows, *Water pollution, *Urban runoff, *Storm runoff, Beaches, Coliforms, Water quality, Water pollution control, Rainfall, Storm waste water, Stream flow, Toxicity, New York.

The impacts of combined sewer overflow discharges on bathing beach areas of New York City are investigated, and the treatment and costs for controlling water quality are defined. Calculated and observed time variable coliform distribution over several storm events are presented for the major water bodies that make up New York harbor. The results of the analysis indicate that discharges within 4 to 6 miles of the beach required control and treatment, while those further away from the areas to be protected had smaller effects on coliform levels at the beach, and treatment was not required to meet existing coliform standards. The cost of controls, even on this scale, are substantial and could represent 200 million dollars. One method for defining critical wet weather events has been identified and can be considered for use in developing frequency information which could provide a part of the basis for wet weather quality criteria. In its most generalized form the approach could consider hourly rainfall and stream flow records, variable runoff coefficients, and variable constituent concentrations as a function of rainfall intensity or volume. In the case of biological effects of instream concentrations of contaminants, it is necessary to consider the time of exposure in addition to the concentration of the contaminant. This is due to the transient nature of the intermittent loads from storm runoff events. (Moore-SRC)
W81-02759

THE RESPONSE OF GREAT LAKES ESTUARIES TO STORMWATER RUNOFF,
Corps of Engineers, Buffalo, NY. Buffalo District.
J. R. Adams, and S. M. Yaksich.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December 1980. p 281-300, 14 Fig, 2 Tab, 1 Ref.

Descriptors: *Storm runoff, *Storm water, *Water pollution, *River flow, Water quality, Water chemistry, Urban runoff, River mouth, Estuarine environment, Lake stages, Seasonal variation, Water pollution sources, *Great Lakes estuaries, Lake Erie, Maumee River.

Glacial rebound of the northern shore of Lake Erie has resulted in drowned rivermouths of southern shore tributaries. Transport of material through these estuaries depends not only on river stage but also lake stage. Three separate studies of water chemistry in the lower Maumee River were conducted during 1974 and 1975. Base flow river conditions and the resultant estuary chemical variations were measured during the summer of 1974, and winter storm runoff effects were measured during January and February 1975. Additional sampling and analysis were conducted during the summer of 1975, giving a fairly complete record of water chemistry variability. Winter storm runoff was also measured in the estuary of the Cuyahoga River, with simultaneous river and estuary sampling over the hydrograph for selected pollutants. This analysis demonstrates that the estuarine reach of the Maumee River is impacted by pollutants generated in the remainder of the basin, and that the water quality problems in the Toledo urban area are not solely the results of Toledo's own pollution of the river. Inputs of pollutants to the river during even moderately small summer storms can be considerably larger than inputs from Toledo. Impacts are increased by the fact that the entire volume of such summer storms does little more than replace a single volume of the estuarine volume. This polluted water often becomes stagnant in the estuary. In warm weather these events multiply to severely degrade the quality of water in the Maumee River. (Moore-SRC)
W81-02760

WATER QUALITY AND URBAN RUNOFF IN SELECTED CANAL COMMUNITIES ALONG THE TEXAS COAST,
Hays and Lindsey, Inc., Austin, TX.
A. L. Messenger, and T. D. Reynolds.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 301-322, 9 Fig, 1 Tab, 10 Ref.

Descriptors: *Water quality, *Urban runoff, *Canals, *Rainfall, *Texas, Land development, Wastewater, Dissolved oxygen, Streeter-Phelps equations, Nutrients, Pesticides, Suspension, Sediments, Model studies, Storm runoff.

Water and runoff samples from seven waterfront communities in the Galveston Bay area were collected and analyzed in order to evaluate causes of canal water quality problems. Until present, community design has been based on optimum utilization of land area with little or no regard toward the effect of development on water quality. The primary cause of water quality problems in these communities appears to be urban runoff. Samples of canal waters were collected over a five-month period and analyzed for nutrients, oxygen demand, pesticides, and hydrological variables, including Rhodamine dye concentrations. In general, canal waters exerted BOD5 values of 2-10 mg/1 with no problems associated with toxic substances. Evaluation of domestic wastewater data from centralized treatment facilities indicates that these wastewater streams are not major sources of pollution loading. Runoff samples were collected from three rainfall-runoff events and were found to contain significant amounts of carbonaceous material. Also, the possibility of canal sediment resuspension by point discharge of runoff was investigated using a canal model. The two-year frequency rainfall event for the Galveston area was found to produce significant resuspension of high BOD5 benthic sediments. These data were applied using the modified Streeter-Phelps equations for estuarine dissolved oxygen analysis and were found to fit actual conditions with reasonable accuracy. (Authors' abstract)
W81-02761

THE RESPONSE OF SUBTIDAL INFAUNAL COMMUNITIES TO A CHANGE IN WASTEWATER DISCHARGE,
Washington Univ., Seattle. Coll. of Fisheries.
R. M. Thom, and K. K. Chew.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 324-340, 8 Fig, 1 Tab, 16 Ref.

Descriptors: *Combined sewer overflows, *Storm waste water, *Water pollution, *Fauna, Waste water, Rainfall, Marine animals, Urban runoff, Invertebrates, Estuarine environment, Polychaetes, Crustaceans, Species diversity, Water depth, *Seattle, Washington, Puget Sound.

During rainy periods, sewage treatment plants in Seattle, Washington, become overloaded and some of the material in the sewers is released through combined sewer overflows (CSO). The CSO discharging the greatest volume of sewage into marine waters in Seattle is located at Denny Way in Elliot Bay, Puget Sound. The impact of this ephemeral source of raw waste water and street runoff on the macroinfaunal communities was evaluated using samples taken after periods of highest (April) and lowest (August) frequency of discharge. In April, the community nearest the overflow was characterized by a high number of indi-

viduals, a low number of taxa, a low species diversity, a high abundance of the polychaete Capitella capitata, and a high relative number of polychaetes. There was an area of markedly low infaunal abundance bordering the region of acute impact. Diversity and number of taxa were highest at the sites furthest from the overflow. The samples in August showed similar trends relative to the overflow in number of individuals, number of taxa, species diversity and community composition by species, phyla, and feeding type. Differences among all sites in these parameters were less pronounced during this period. A notable difference was the switch in numerical dominance to the leptostracan crustacean Nebalia pugettensis at the site nearest the overflow. A cluster analysis indicated that depth was of primary importance, and that the CSO was of secondary in producing among site differences. (Moore-SRC)
W81-02762

PRODUCTIVITY RESPONSES OF LAKE EOLA TO URBAN RUNOFF,
University of Central Florida, Orlando. Dept. of Civil Engineering and Environmental Science.
H. H. Harper, III, Y. A. Yousef, and M. P. Wanielista.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 341-370, 7 Fig, 10 Tab, 13 Ref.

Descriptors: *Productivity, *Storm runoff, *Urban runoff, *Water pollution, *Eutrophication, Nutrients, Phosphorus, Dissolved oxygen, Nitrogen, Sediments, Heavy metals, Algal growth, Bioassay, Wastewater management, Lakes, Florida, *Lake Eola.

Lake Eola is a land-locked lake located in downtown Orlando, Florida. It is a focal point for the city and is visited by many tourists for its aesthetic appeal. From all indications, both visually and analytically, Lake Eola appears to be a lake in severe ecological distress. Persistent algal blooms exist virtually year round. Concentrations of dissolved oxygen, although usually at or above saturation near the surface drop periodically during the spring and summer months to less than 1 mg/l in deep areas of 4.0 m or more water column. Phosphorus from the bottom sediments was released up to a level of 250 mg/square m after two months of anoxic conditions. Bioassay experiments were utilized to study the impact of stormwater runoff, untreated and coagulated on productivity of Lake Eola water. It is concluded that management of stormwater runoff is essential if restoration of Lake Eola is to be successful. Considerable amounts of nutrients are released by stormwater runoff. Phosphorus is probably the most important nutrient in regulation algal production in Lake Eola. From bioassay experimentation, stormwater up to 25% mixture with lake water will enhance algal productivity. A mixture of lake water and dry weather flow from storm drains did not produce changes in algal production. If stormwater runoff is coagulated with alum before its release to the lake, no significant increase in algal production will be produced. Stormwater contains heavy metals and organic compounds which may be in concentrations toxic to algal species in lake water. (Moore-SRC)
W81-02763

WATER QUALITY AND BIOLOGICAL DEGRADATION IN AN URBAN CREEK,
Woodward Clyde Consultants, San Francisco, CA.
R. Pitt, and M. Bozeman.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 371-405, 5 Fig, 19 Tab, 14 Ref.

Descriptors: *Urban runoff, *Water pollution, *Aquatic animals, *Storm runoff, *Water pollution sources, Heavy metals, Nutrients, Nitrogen, Lead, Feces, Fertilizers, *California, Coyote Creek, San Jose.

Coyote Creek, near San Jose, California is being studied to determine the effects of urban runoff on water quality and biological organisms in the creek. Most of the urban runoff pollutants are soluble, and can be carried in the water columns of receiving waters. Almost all (95%) of the lead compounds present in urban runoff are expected to be insoluble particulates. Non-urban stations are affected by runoff from undeveloped and agricultural areas, and urban stations are affected by runoff from those areas as well as the runoff from urban areas. Urban runoff pollutant sources include: lawn and landscaped areas, vacant lots, rooftops, sidewalks, parking lots, and street surfaces. Vacant land and landscaped areas are among the most pervious surfaces in urban areas and are located farthest from urban drainage systems, therefore they contribute only a small fraction of the pollutants. Street surfaces are located very close to the storm drainage system and are almost impervious. They comprise about 15-20% of the study area, and most of the runoff is expected to reach the outfall. Automobile activity is responsible for most of the heavy metal yield in the runoff and about half of the total solids yield. Vegetation sources contribute most of the oxygen-demanding materials, while animal feces and fertilizers are thought to contribute most of the nitrogen in urban runoff. Preliminary biological investigations in Coyote Creek have indicated distinct differences in the taxonomic composition and relative abundance of the aquatic biota present in various reaches of the stream. The non-urban sections of the creek support a comparatively diverse assemblage, including 12 species of fish, and various benthic macroinvertebrates. The urban portions comprise an aquatic community that is generally lacking in diversity and is dominated by pollution-tolerant organisms. (Moore-SRC)
W81-02764

NATIONWIDE ASSESSMENT OF URBAN STORMWATER POLLUTION IMPACTS ON RECEIVING WATER BODIES,
Florida Univ., Gainesville.
J. P. Heaney, W. C. Huber, and M. E. Lehman.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 407-436, 2 Fig, 5 Tab, 18 Ref.

Descriptors: *Urban runoff, *Storm runoff, *Water pollution, *Literature review, Fishkill, Water quality, Beaches, Environmental effects, Storm water, Water pollution sources.

The projected costs for abating urban stormwater pollution through elimination or reduction of discharges range in the billions of dollars. This has forced a look beyond abatement of discharges to the receiving water bodies for insights as to what are the impacts, where are they, and are they significant. A study was undertaken to inventory documented receiving water impacts from urban runoff on a nationwide basis. The search for documentation included published and unpublished literature, Section 201 and Section 208 projects (PL92-500), EPA-furnished project materials, EPA fish kill data files, National Urban Runoff Program Proposals, and miscellaneous water quality reports and permit files. Impacts due to stormwater runoff can be defined at three levels: policy or master plan violations; criteria or standards violations; and actual environmental degradation or loss of beneficial use, such as fish kills and beach closings. Findings to date indicate that documented case studies of impacts of urban runoff on receiving waters are scarce. Most cases of documented impacts were made for minor receiving water bodies. Large water bodies tended to have sufficient dilution, adequate flushing or multiple source imputs which obscure impact differentiation. The significance of stormwater impacts on receiving water bodies cannot be assessed at this time. The sparseness of documented cases, the lack of detailed data, and the general focus of stormwater investigations do not provide a substantial basis for determinations. (Moore-SRC)
W81-02765

STATISTICS OF RECEIVING WATER RESPONSE TO RUNOFF,
Manhattan Coll., Bronx, NY. Environmental Engineering and Science Program.
D. M. DiToro.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December 1980. p 437-465, 10 Fig, 1 Tab, 12 Ref, 1 Append.

Descriptors: *Runoff, *Storm runoff, *Water pollution, *Statistical methods, Combined sewer overflows, Storm waste water, Mathematical models, Mathematical studies, Rainfall, Dissolved oxygen, Biochemical oxygen demand.

The analysis of receiving water responses to intermittent discharges from separate and combined sewer overflows is a problem of substantial difficulty. The problem setting is inherently time variable due to the transient mass discharges, and although a time variable integration of the mass balance equations describing the receiving water response is possible, it is an unwieldy and laborious undertaking. An analysis is presented for the mean and variance of a one dimensional advective dispersive system that is subjected to random inputs of runoff. Analytical solutions are available for which the mass input is represented as a Poisson process of delta functions. The effects of event to event variability of runoff mass discharges are included in the formulation as are the random times between overflows. The method of solution evaluates the overlapping effects in the receiving water due to the persistence of discharged mass. Both conservative, first order reactants, and sequentially reacting substances are considered. The solutions have certain unexpected properties. In particular, the normalized variance of biological oxygen demand and dissolved oxygen are symmetric about the discharge point, whereas the means of the concentration are not. This is explained in terms of the effects of advection and dispersion of fluctuations. The analytical solutions are compared to simulated results using an observed hourly rainfall sequence. The results indicate that the within event variability is not significant, if the receiving water dispersion is large enough. It is also pointed out that treatment devices such as retention basins which remove a certain average fraction of the overflowing mass are less effective in removing variance in the receiving water. This phenomenon is of importance in the evaluation of the probable benefit of runoff treatment. (Moore-SRC)
W81-02766

CONTINUOUS RECEIVING WATER QUALITY MODELING FOR URBAN STORMWATER MANAGEMENT,
Duke Univ., Durham, NC. Dept. of Civil Engineering.
M. A. Medina, Jr.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 466-501, 9 Fig, 2 Tab, 18 Ref, 2 Append, R-802411.

Descriptors: *Urban runoff, *Waste water treatment, *Storm waste water, *Water pollution, *Mathematical models, Model studies, Water quality, Dissolved oxygen, Storm runoff, Rainfall, Iowa, Des Moines River.

A simplified continuous receiving water quality model has been developed as a planning guide to permit preliminary screening of areawide waste water treatment strategies. The model simulates the hypothetical response of the stream or tidal river system to the separate and combined effects of waste inputs from: (1) upstream sources, (2) dry weather urban sources, and (3) wet weather urban sources. The total hours of runoff-producing rainfall throughout a year are separated into storm events by defining a minimum inter-event time. For a given storm event, the runoff and pollutant loads are summed and critical dissolved oxygen concentrations are estimated as a function of sever-

al hydrodynamic and biochemical parameters. Alternative control strategies are evaluated in terms of relative impacts by determining the probability of occurrence of water quality violations. Model output includes the downstream dissolved oxygen sag curves computed per each event, and the dissolved oxygen profile computed at a user-specified location downstream for all simulated events. An application to the Des Moines River at Des Moines, Iowa, is presented. (Author's abstract)
W81-02767

POTENTIAL OF URBAN STORMWATER IMPACTS BASED ON COMPARATIVE ANALYSIS OF WET AND DRY WEATHER POLLUTANT LOADS,
Municipal Environmental Research Lab., Edison, NJ. Storm and Combined Sewer Section.
D. Ammon, and R. Field.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December 1980. p 502-522, 5 Fig, 14 Tab, 32 Ref.

Descriptors: *Urban runoff, *Storm runoff, *Combined sewer overflows, *Water pollution, Storm waste water, Heavy metals, Biochemical oxygen demand, Chemical oxygen demand, Hydrocarbons.

Urban stormwater discharges and combined sewer overflows are significant contributors of many pollutants to receiving waters. Summaries of urban wet-weather characterization data are presented for several groups of parameters including heavy metals, petroleum hydrocarbons, biochemical oxygen demand (BOD) and chemical oxygen demand. Comparisons are presented between the pollutant loads from urban wet-weather discharges and from publicly owned treatment works effluents to indicate the relative importance of each source. Combined sewer overflows are calculated to contribute about 380 lb/acre/yr of BOD, which is about 28% of the annual load from the combined sewered area with no treatment of the dry-weather flow. In separate sewered areas, urban stormwater discharges contribute about 70 lb/acre/yr of BOD, which is about 45% of the annual BOD load if secondary treatment is provided for the dry-weather flow. The relative magnitudes of urban wet-weather loads compared to the publicly owned treatment works discharges are much greater during and following storm events. Several heavy metals occur in sufficient concentrations in urban stormwater discharges and combined sewer overflows to exceed quality criteria even with many dilutions. Load comparisons show that urban wet-weather discharges contribute more of several metals, such as cadmium, chromium and lead, to receiving waters than treatment works effluents. Urban stormwater and combined sewer overflows contribute significant portions of oil and grease, and petroleum hydrocarbons to the environment. (Moore-SRC)
W81-02768

THE USE OF RECEIVING WATER QUALITY MODELS IN URBAN RUNOFF POLLUTION ABATEMENT: APPLICATION TO MARGINAL BENEFIT - MARGINAL COST ANALYSIS,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
C. B. Murphy, Jr., G. J. Welter, D. A. MacArthur, and R. P. Canale.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 524-556, 16 Fig, 2 Tab, 4 Ref.

Descriptors: *Urban runoff, *Water pollution, *Model studies, *Cost-benefit analysis, Water quality, Storm waste water, Storm runoff, Combined sewers, Water pollution control, Combined sewer overflows, Hydrological regime, Temperature.

Urban storm runoff has been determined by a number of investigators to represent a significant portion of the water pollution problem and abatement of this source has been recognized as a necessary consideration in achieving the national water quality goals. However, due to the highly irregular nature of the runoff phenomenon abatement measures that address this problem tend to be expensive and difficult to size. Using ongoing studies of combined sewer systems in Rochester, New York and Washington, D. C., as case studies, a procedure is presented for the application of receiving water analyses in urban runoff planning. The studies in both areas have included the development of water quality models based on familiar concepts of mass balance and calibrated against detailed field surveys and laboratory experiments. In an analysis of marginal costs and marginal benefits associated with various combined sewer overflow abatement alternatives, a series of model runs are made to project the impact of various waste discharges from the alternate system configurations on the receiving waters under several hydrologic regimes and ambient temperatures. The conjoint probabilities of the receiving water conditions and storm loads are determined on the basis of historical records and used to project the expected water quality under the alternative system configurations. These projections can be quantified as water quality improvements in terms of expected degree of contravention of stream standards with regards to frequency, duration, areal extent and peak concentration. On the basis of this analysis of project cost estimates drawn from generalized cost curves, marginal costs and benefits can be displayed graphically for each alternative. (Moore-SRC)
W81-02769

METHODOLOGY FOR EVALUATING THE IMPACT AND ABATEMENT OF COMBINED SEWER OVERFLOWS, A CASE STUDY OF ONONDAGA LAKE, NEW YORK,
Stearns and Wheler, Cazenovia, NY.
P. E. Moffa, J. C. Byron, S. D. Freedman, J. M. Karanik, and R. Ott.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December, 1980. p 557-589, 14 Fig, 3 Tab, 18 Ref. R805096010.

Descriptors: *Combined sewer overflows, *Storm runoff, *Water pollution, *Mathematical models, Model studies, Urban runoff, Dissolved oxygen, Phosphorus, Computer models, Recreation, Coliforms, Rainfall, Cost analysis.

A general methodology is presented for the evaluation of the impact and abatement of combined sewer overflows on receiving waters. It was developed from experience with Onondaga Lake in Central New York which receives combined sewer overflows from the City of Syracuse. Field investigations of the combined sewer system and the receiving water must first be undertaken. Use of a computerized data bank has been found virtually essential for the storage and manipulation of the large quantity of data resulting from the sampling and analysis. Mathematical modeling of the receiving water is undertaken to evaluate water quality as a function of pollutant load; the storm sewer system is modeled to determine the quantities of pollutants discharged during various storm conditions. Abatement alternatives and their respective costs are investigated for the reduction of pollutants from wet-weather sources, particularly combined sewer overflows. From the models it was determined that the impact of combined sewer overflows on dissolved oxygen concentrations in Onondaga Lake will not be critical after tertiary treatment for dry-weather waste water are placed in operation. Combined sewer overflow contributions of phosphorus will be negligible in comparison to those from other sources. In an average rainfall year, 38 violations of the fecal coliform standard will occur in the area of the lake intended for contact recreation. If abatement of pollution were to follow the 'general optimum solution' of this methodology, there would still be 13 annual violations. (Moore-SRC)
W81-02770

ENVIRONMENTAL EFFECTS OF WESTERN COAL SURFACE MINING, PART VI - SMALLMOUTH BASS AND LARGEMOUTH BASS IN THE TONGUE RIVER RESERVOIR, MONTANA, 1975-76,
Montana Cooperative Fishery Research Unit, Bozeman.
R. F. Penkal, and R. W. Gregory.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-194319, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-045, May, 2720. 54 p, 6 Fig, 14 Tab, 47 Ref. R803950.

Descriptors: *Fish populations, *Bass, *Coal mining, Strip mines, *Environmental effects, Reservoirs, Turbidity, Mortality, Growth, Water pollution sources, *Mine wastes.

Population parameters of smallmouth bass (Micropterus dolomieui) and largemouth bass (M. salmoides) were studied during 1975 and 1976, before expansion of surface coal mining adjacent to the Tongue River Reservoir in southeastern Montana. Reproductive success, as determined by alongshore seining, varied in different areas of the reservoir and may be correlated to turbidity. Population estimates were obtained at night during spring and fall 1976 with boat electrofishing gear. For yearling and older smallmouth bass the fall population of 13.0 fish/ha and the standing crop of 2.03 kg/ha represented 80 and 84% of the totals for basses in the reservoir. The largemouth bass population and standing crop during fall 1976 was 3.2 fish/ha and 0.32 kg/ha. The dominance by smallmouth bass of all year classes for both species except age-1, was attributed to a much higher mortality of underyearlings among largemouth bass. This higher mortality of largemouth bass may be correlated to a lack of shoreline vegetation in the reservoir. Summer mortality of age-2 and older smallmouth bass, estimated from the reduction in numbers of marked fish, was about 40%. Smallmouth bass growth and condition were better in the upper than lower end of the reservoir; the difference may be due to forage fish availability. Growth and length-weight relationships were above average for both species when compared with basses in other northern waters, indicating no noticeable effect from nearby surface coal mine operations at the time of the study. (Author's abstract)
W81-02775

WASTE DISCHARGE REQUIREMENTS FOR NONSEWERABLE WASTE DISPOSAL TO LAND,
California State Water Resources Control Board, Sacramento.
A. L. Franks.
Report, July 1980. 93 p, Append.

Descriptors: *California, *Waste disposal, *Waste dumps, *Groundwater pollution, Landfills, Land disposal, Groundwater contamination, Leachates, Industrial wastes, Solid wastes, Farm wastes, Animal wastes, Sludge disposal, Infiltration.

This document, developed to describe portions of the California Administrative Code regarding waste disposal to land, indicates general guidelines and minimum standards for such disposal. However, due to specialized local conditions, Regional Boards may establish more stringent standards on a waste disposal operation or a site closure. The report contains a summary of relationships between solid wastes and water quality, the disposal site classification system, examples of waste discharge requirements, closure requirements, and a discussion of selected sections of the Code regarding waste disposal to land. There is also a discussion of the parameters that are considered in formulating waste discharge requirements, developing closure requirements, providing for financial responsibility for waste disposal sites, and the administration of the State Site Closure and Maintainance Revolving Account. Not included, but to be developed at a later date, are guidelines to determine the acceptability of a report on assurances that monies are available, in the amount estimated, as called for in Section 2557 of the Code. (Garrison-Omniplan)
W81-02798

KELP BEDS AT SAUNDERS REEF, MENDOCINO COUNTY.
California State Water Resources Control Board, Sacramento.
California Marine Waters, Areas of Special Biological Significance, Reconnaissance Survey Report. Water Quality Monitoring Report No 80-3, September 1980. 42 p, 3 Fig, 5 Tab, 20 Ref.

Descriptors: *California, Marine resources, *Kelps, *Reefs, *Marine biology, Marine geology, *Coastal waters, Marine plants, Biological oceanography, Environmental protection, Wastewater outfall, On-site data collections, Saunders Reef, Mendocino County.

The kelp beds at Saunders Bay in northern California are designated by the California State Water Resources Control Board as an Area of Special Biological Significance (ASBS). It is a complex area bounded on the east by cliffs supporting a characteristic maritime bluff flora. To evaluate the status of protection of the marine resources of this ASBS, a reconnaissance survey was performed. The study concluded that (1) activity around and west of Highway 1 should be carefully planned to avoid increased erosion, view alteration and possible wastewater escape into the ASBS; (2) increased public access will impact the relatively pristine condition of the ASBS; (3) future impact studies should include long-term studies of the impacted communities with field experiments to test any effects of perturbations. Lack of access, rough sea conditions, and the presence of red abalone all suggest that the area has not been greatly affected thus far by man's activities; this may change with increased use by skin divers and greater coastal access. Some of the surrounding land is subdivided for home construction, and development could increase bluff erosion and restrict the view of the reef. The use of home septic tank systems has the potential of allowing polluted water into the ASBS. (Garrison-Omniplan)
W81-02799

SAN DIEGO MARINE LIFE REFUGE, SAN DIEGO COUNTY.
California State Water Resources Control Board, Sacramento.
California Marine Waters, Areas of Special Biological Significance, Reconnaissance Survey Report. Water Quality Monitoring Report No 80-5, September, 1980, 52 p, 1 Fig, 5 Tab, 24 Ref, 4 Append.

Descriptors: *California, Marine resources, *Marine biology, *Coastal waters, Marine geology, Marine plants, Biological oceanography, Environmental protection, Wastewater outfall, Wastewater pollution, Storm wastewater, On-site data collections, *San Diego Marine Life Refuge.

Areas of Special Biological Significance (ASBS) have been designated by the California State Water Resources Control Board in its effort to adopt water quality control plans for wastes discharged to ocean waters. To evaluate the protection status of marine resources at San Diego Marine Life Refuge, an ASBS, a reconnaissance survey was conducted that integrated all available hydrographic, geologic and biological information. Means of investigation included a search of records, map reconnaissance, shoreline and underwater observations, interviews, and a literature review. There appeared to be no actual point source pollution threats except that of sewage spills during periods of heavy rainfall. Sailing, shore fishing, snorkeling, SCUBA diving, surfing, body surfing, and tide-pooling are some of the water-use recreational activities that occur within the Refuge, which is adjacent to Scripps Institute of Oceanography in La Jolla. The study suggested periodic but regular monitoring of the ASBS to evaluate accurately the status of protection afforded the area. The study also urges consideration be given to extending the boundaries of the Refuge to include the head of Scripps Canyon. (Garrison-Omniplan)
W81-02800

JULIA PFEIFFER BURNS UNDERWATER PARK, MONTEREY COUNTY.
California State Water Resources Control Board, Sacramento.
California Marine Waters, Areas of Special Biological Significance, Reconnaissance Survey Report. Water Quality Monitoring Report No 80-4, September, 1980. 76 p, 11 Fig, 9 Tab, 33 Ref, 2 Append.

Descriptors: *California, Marine resources, *Marine biology, *Waste water outfall, Marine geology, *Marine fisheries, Submarine canyons, Submerged plants, Biological oceanography, Coastal waters, Environmental protection, Contamination, Waste water pollution, Storm waste water, On-site data collections, *Julia Pfeiffer Burns Underwater Park.

Diverse and abundant assemblages of sessile, filter-feeding invertebrates make the Julia Pfeiffer Burns Underwater Park one of the most beautiful locations on the California coast. This area was designated an Area of Special Biological Significance (ASBS) by the California State Water Resources Control Board in the adoption of water quality control plans for wastes discharged to ocean waters. Subtidal regions were surveyed using SCUBA to note topography, habitats, and macroorganisms; other data were collected using photography and landside observations. Because of the ASBS's poor access from land and sea, and its distance from Monterey, no threats to water quality were found. However, some impacts are possible in the future because nearby parks allow hiking and picnicking, and commercial fishing is allowed within the boundaries of the ASBS to a depth as shallow as 325 feet. Sportfishing is limited by the lack of accessibility. Although the ASBS is within Kelp Lease Area 214, no harvesting of giant kelp takes place. The ASBS is contained within the California State Sea Otter Reserve. There are many kinds of biota found in the underwater park that are listed in the report. For safety reasons, the study recommends that recreational diving not be permitted. (Garrison-Omniplan)
W81-02801

INTERACTIONS OF LIGHT AND NITROGEN SOURCE AMONG PLANKTONIC BLUE-GREEN ALGAE,
Alabama Univ., University. Dept. of Biology.
A. K. Ward, and R. G. Wetzel.
Archiv fur Hydrobiologie, Vol 90, No 1, p 1-25, September, 1980. 12 Fig, 4 Tab, 44 Ref.

Descriptors: *Plankton, *Cyanophyta, *Light penetration, *Nitrogen fixation, Eutrophication, Nutrients, Aquatic algae, Biomass, Aquatic life, Aquatic microorganisms.

Studies were conducted to describe the light regime, possible nitrogen sources and genera of blue-green algae associated with nitrogen-fixing, epilimnetic blue-green algae and non-nitrogen-fixing metalimnetic blue-green algae, to evaluate growth rates of representative isolates of blue-green algae on different nitrogen sources under light regimes similar to those found in natural populations, and to evaluate short-term responses to changes in light intensity in relation to photosynthetic rates and changes in carbon and nitrogen content with various nitrogen sources. Two different aquatic systems were studied, one the moderately productive Lawrence Lake and the other the hypereutrophic Wintergreen Lake. The findings suggested that the nitrogen source determined the lowest light intensity necessary to maintain growth in these aquatic systems. Most of the carbon and nitrogen fixation occurred within an array of light intensities ranging from very low to high, but significantly less than surface values. Based on saturation curves and lake profiles of nitrogen and carbon fixation in this study, the range of light intensities should result in a more balanced C:N ratio than continuous exposure to surface values or very low light intensities. Additionally it would provide sufficient photogenerated reductant and carbon reserve for maintenance of carbon and nitrogen fixation. Spatial optimization with regard to light and nitrogen source among planktonic blue-green algae is suggested by the findings of this study. (Baker-FRC)
W81-02807

POLLUTION OF SEA WATER AND MARINE SEDIMENTS IN COASTAL AREAS,
Orleans Univ. (France).
For primary bibliographic entry see Field 5B.
W81-02808

THERMAL TOLERANCE OF THE ISOPOD LIRCEUS BRACHYURUS (CRUSTACEA:ISOPODA),
Tennessee Univ., Knoxville. Dept. of Zoology.
N. J. Cheper.
American Midland Naturalist, Vol 104, No 2, p 312-318, October, 1980. 1 Fig, 1 Tab, 18 Ref.

Descriptors: *Lirceus brachyurus, *Invertebrates, *Isopods, *Thermal stress, Thermal pollution, Aquatic life, Aquatic animals, Water pollution effects, Temperature, Water temperature, Heated water, Hydroelectric plants.

The temperature tolerance of a freshwater macroinvertebrate, the isopod Lirceus brachyurus (Crustacea:Isopoda) was investigated. Isopods were collected between August 1977 and July 1978 from a small tributary of Buffalo Creek in Anderson County, Tennessee. For each tolerance test, 12 animals were immediately exposed to the test temperature and 12 were gradually exposed to the test temperature. Animals were checked for mortality at 1/2, 1, 2, 4 and 8 hr after exposure had begun. Subsequent examinations were made every 8 hr for 2 wk. Only at the highest temperature, 35C, did the manner of exposure, gradual vs immediate, make a difference in the adaptability of the test animals. At this temperature, animals exposed gradually succumbed less rapidly. However, once this temperature was reached, there was no difference in rate of death. Animals acclimated at 25C showed high natural mortality rates (60%) during acclimation. The highest temperature tolerated by the species exceeded that to which the animal would be exposed under natural conditions, thus forming a safety margin. The results indicate that Lirceus brachyurus populations would be severely affected by hot water discharges, while cold water discharges during initiation of power plant output or after periods of plant shutdown would not affect isopod populations. (Baker-FRC)
W81-02810

INCIDENCE OF PLASMIDS IN MARINE VIBRIO SPP. ISOLATED FROM AN OIL FIELD IN THE NORTHWESTERN GULF OF MEXICO,
Houston Univ., TX.
For primary bibliographic entry see Field 5A.
W81-02813

MEASUREMENT OF PHYSIOLOGICAL CONDITION OF MUSSELS TRANSPLANTED ALONG A POLLUTION GRADIENT IN NARRAGANSETT BAY,
Environmental Research Lab., Narragansett, RI.
J. Widdows, D. K. Phelps, and W. Galloway.
Marine Environmental Research, Vol 4, No 3, p 181-194, 1980-1981. 2 Fig, 4 Tab, 34 Ref.

Descriptors: *Mussels, *Narragansett Bay, *Bioindicators, Animal physiology, *Water pollution effects, Pollutant identification, Organic compounds, Metals, Environmental effects, Sediments, Growth rates, Oil pollution, Oxygen requirements, Metabolism, Rhode Island.

Mussels transplanted to 4 sites along a pollution gradient in Narragansett Bay declined in performance and physiological condition from south to north, corresponding with increasing water pollution. Hydrocarbons in surface sediments increased from 0.11 mg per g at the relatively unpolluted southernmost site to 2.04 mg per g dry weight at the most polluted northern site. Metals (Cd, Cr, Cu, Ni, Pb, and Zn) showed a similar increase. Oxygen consumption at the stations did not vary significantly. Clearance rates declined from 5.21 liters per hour at the least polluted station to 2.54 liters per hour at the most polluted station in August, 5.91 liters per hour to 3.19 liters per hour in October. Ammonia excretion was highest at the most polluted site. The O:N ratio declined from 75

in the north to 29.6 in the south in August, but was not statistically different in October. An O:N ratio of 30 or less indicates a very stressed condition. Scope for growth declined from 35.64 Joules per hour (south) to 7.17 J per hour (north) in August and 28.90 (south) - 7.25 (north) J per hour in October. (Cassar-FRC)
W81-02819

IMPACT OF A COMBINED SEWER OVERFLOW ON THE ABUNDANCE, DISTRIBUTION, AND COMMUNITY STRUCTURE OF SUBTIDAL BENTHOS,
Washington Univ., Seattle. Coll. of Fisheries.
J. W. Armstrong, R. M. Thom, and K. K. Chew.
Marine Environmental Research, Vol 4, No 1, p 3-23, 1980-81. 9 Fig, 4 Tab, 41 Ref.

Descriptors: *Benthic fauna, *Invertebrates, *Sewage effluents, Intertidal areas, Organic matter, Combined sewers, Path of pollutants, Water pollution effects, Benthos, Marine animals, Biological communities, *Puget Sound, Seattle, Washington, Municipal wastes, Waste water treatment, Polychaetes, Mollusks, Sediments, Heavy metals, Metals, *Combined sewer overflows.

Seattle, Washington, discharges its combined stormwater and sanitary wastes into an intertidal area of Puget Sound. During rain storms, capacities of the treatment plants are exceeded, releasing untreated domestic and industrial wastes into the marine environment. The effect of these pollutants on marine invertebrates was determined during a study conducted during April and May, 1977. Fauna close to and southwest of the outfall were most acutely affected. Opportunistic species, the polychaete Capitella capitata and the amphipod Aoroides columbiae, favored the most polluted sites, where zinc, copper, and lead were present in the sediment and volatile organic matter was plentiful. Burrowing deposit feeders were common. At sites further from the outflow, mollusks and crustaceans, especially the bivalve Axinopsida serricata, became more abundant. Surface feeding organisms also were more plentiful. Shallow subtidal areas (9 m below MLLW) appeared more affected by the pollution than deeper sites (13 and 24 m below MLLW). (Cassar-FRC)
W81-02820

SEDIMENT CHARACTERISTICS OF ELEOCHARIS ACICULARIS (L.) R. S. SITES IN STREAMS AND LAKES OF CENTRAL PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Botany.
G. C. Kroh, and R. D. Schein.
Journal of Environmental Quality, Vol 10, No 1, p 49-52, January-March, 1981. 1 Fig, 2 Tab, 20 Ref.

Descriptors: *Acid mine water, *Water pollution effects, *Rooted aquatic plants, Acid streams, Mine drainage, Mine wastes, Sediments, Nutrients, Absorption, Aquatic productivity, *Pennsylvania, Acidity, Phosphorus, Soil chemistry.

Many streams of Central Pennsylvania have been polluted by acid mine drainage from coal mining activities. These streams are clear, unproductive, and contain few plankton and no fish. In order to restore aquatic communities to these waters, the macrophyte Eleocharis acicularis (L.) R. and S. (slender spikerush) was examined for its ability to grow on stream sediments. Radioactively labeled phosphorus was absorbed by the roots of the slender spikerush and transported to the leaves. Analyses of sediments from 14 different locations where the plant was growing showed that these macrophytes were generalists which could survive a large variety of chemical parameters provided that the predominant sediment make up was a silt-clay. The plants were very acid tolerant and provided a structural niche for periphyton and invertebrate consumers. The slender spikerush was also able to stabilize and modify the alluvial sediment with its filamentous root system and was considered an important factor in the restoration of mine-acid polluted streams. (Geiger-FRC)
W81-02821

THE EFFECT OF GLUCOSE ON THE PRODUCTIVITY OF SEAWATER: AN EXPERIMENTAL APPROACH USING CONTROLLED AQUATIC ECOSYSTEMS,
British Columbia Univ., Vancouver. Dept. of Oceanography.
T. R. Parsons, L. J. Albright, F. Whitney, C. S. Wong, and P. J. Le B. Williams.
Marine Environmental Research, Vol 4, No 3, p 229-242, 1980-1981. 9 Fig, 3 Tab, 19 Ref.

Descriptors: *Productivity, *Sea water, *Carbohydrates, Organic matter, Bacteria, Nutrients, Phytoplankton, Algae, Marine algae, Nitrates, *Glucose, Water pollution effects, Photosynthesis, *Ecosystems.

Glucose was added in small quantities (1 or 5 mg per liter) to 60-ton enclosed sea water columns to study the effect of organic loading in marine waters. Additions of glucose and nutrients were made every three or four days over a 28-day period to two enclosures, with only nutrients in the control. Glucose enrichment caused an increase in the heterotrophic bacterial biomass and a decrease in algal production. Nitrate was a limiting factor, bacteria succeeding in competition with the phytoplankton. Secondary and tertiary productivity in the two heterotrophic systems were higher than in the autotrophic control. (Cassar-FRC)
W81-02825

GROWTH RESPONSES OF YELLOW PERCH, PERCA FLAVESCENS (MITCHILL), TO LAKE ACIDIFICATION IN THE LA CLOCHE MOUNTAIN LAKES OF ONTARIO,
Toronto Univ. (Ontario). Dept. of Zoology.
P. M. Ryan, and H. H. Harvey.
Environmental Biology of Fishes, Vol 5, No 2, p 97-108, April, 1980. 6 Fig, 2 Tab, 32 Ref.

Descriptors: *Perch, *Lakes, *Acidic water, Bioindicators, Growth rates, Freshwater fish, Yellow perch, La Cloche Mountains, *Ontario, Fish reproduction, Fish populations, Stress, Water pollution effects, Hydrogen ion concentration, Size, Environmental effects.

The effects of acid waters on growth of yellow perch were studied from 1966 to 1974 in 38 lakes in the La Cloche Mountains of Ontario. Fish 1 to 3 years old grew more rapidly; fish 4 to 9 years old had reduced growth rates. The relationship of mean length at a given age to lake pH (which varied from 4.10 to 6.48) was best described by linear equations. The increased growth rates of 1 to 3 year fish can be attributed to increases in food supply caused by a decrease in competition from less tolerant species. The most acid lakes contained very few fish 0 to 2 years old. Older perch, 4 to 9, showed reduced growth rates, possibly from acid stress, which can cause severe osmotic disturbances. Fish respond to this by expending energy at the expense of growth. Food species are also fewer. The growth rate of yellow perch may be useful as an indicator of environmental stress. (Cassar-FRC)
W81-02833

CHANGES IN NITROGEN CYCLING AT AN OLD-GROWTH DOUGLAS-FIR SITE AFTER DISTURBANCE,
Oregon State Univ., Corvallis. Dept. of Forest Science.
P. Sollins, K. Cromack, Jr., F. M. McCorison, R. H. Waring, and R. D. Harr.
Journal of Environmental Quality, Vol 10, No 1, p 37-42, January-March, 1981. 3 Fig, 2 Tab, 40 Ref.

Descriptors: *Nitrate, *Soil water, *Water quality control, Nitrogen, Cycling nutrients, Herbicides, Nitrification, Soil water movement, Foliar, Forest management, Seasonal, Ammonia, Leaching, Coniferous forests, *Forest watersheds.

The exportation of dissolved N from terrestrial ecosystems through soil water can affect N availability for productivity as well as the processes in natural streams and water quality. The effects of disturbances on the N cycle were examined in a 450-year-old Douglas-fir stand on a 10.24-ha watershed of the H. J. Andrews Experimental Forest in Oregon. All vegetation was killed by herbicides while causing as little disturbance as possible to the leaf litter and soil. Foliage samples collected in July and August of 1974 were analyzed for N, lignin, and cellulose. The concentration of nitrogen in falling foliage and the soil moisture were greater on the herbicide treated plot than in the control area. Soil solution levels of nitrate and Kjeldahl N were higher on the treated than on the untreated sites at depths greater than or equal to 1 meter or at the bottom of the rooting zone. On the undisturbed plots, nitrate was found in solution at significant levels only at a depth of 2 meters. These findings suggest that studies on the impact of forest management practices or other disturbances on N budgets and water quality should consider measurements of total N transfers, and not only transfers of nitrate N. (Geiger-FRC)
W81-02844

COAL-LIQUEFACTION PRODUCTS, SHALE OIL, AND PETROLEUM. ACUTE TOXICITY TO FRESHWATER ALGAE,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. M. Giddings, and J. N. Washington.
Environmental Science and Technology, Vol 15, No 1, p 106-108, January, 1981. 2 Tab, 31 Ref.

Descriptors: *Oil pollution, *Water pollution effects, *Algae, Fuels, Toxicity, Synthetic fuels, Oil spills, Aquatic life, Aquatic algae, Aquatic plants, Coal liquefaction industry, Shale oil industry, Cyanophyta.

Freshwater algae, Selenastrum capricornutum (a green alga) and Microcystis aeruginosa (a blue-green alga), showed acute toxic effects from exposure to water soluble fractions (WSF) of oils in the following order: coal liquefaction products>shale oil products>petroleum products. WSF's were tested in concentrations of 0.1, 1, 10, and 100%. Most of the 11 coal liquefaction products were toxic at 1% and greater; 4 at 0.1%. Three unrefined shale oils inhibited photosynthesis at 10% and greater and were variably toxic at 1% and less. Two refined shale oils and the 5 petroleum products (DFM, No 2 diesel oil, and three No 6 fuel oils) showed little toxicity at all concentrations with the exception of some at 100% WSF. All samples were tested for absorbance at 254 nm, the absorption maximum for benzene and an approximation of aromatic content. The products with higher absorbances tended to be the most toxic to algae. (Cassar-FRC)
W81-02854

THE INADEQUACY OF EXISTING CHLOROPHYLL-A/PHOSPHORUS CONCENTRATION CORRELATIONS FOR ASSESSING REMEDIAL MEASURES FOR HYPERTROPHIC LAKES,
Department of Fisheries and Oceans, Winnipeg (Manitoba). Freshwater Inst.
R. J. Allan.
Environmental Pollution (Series B), Vol 1, No 3, p 217-231, 1980. 10 Fig, 2 Tab, 25 Ref.

Descriptors: *Eutrophication, *Lakes, *Chlorophyll, Trophic levels, Measurement, Photosynthesis, Phytoplankton, Aquatic life, Aquatic plants, *Canada.

Since 1970 a sporadic data base concerned with nutrient and chlorophyll-a concentrations in the Fishing Lakes and Crooked and Round Lakes has been gathering information under the guidance of the Water Pollution Control Branch, Environment Canada. A systematic bi-weekly survey of nutrient and chlorophyll-a concentrations was conducted in these same lakes between June 1977 and June 1978. During 1978 and 1979 weekly sampling of Rock Lake for nutrients and chlorophyll-a concentrations was carried out during the open water period. The data collected indicate that inaccuracies exist in prediction of lake phosphorus concentrations from phosphorus loading models and mean and maximum chlorophyll-a from lake phosphorus concentrations. The data also indicate that representative sampling to estimate true phosphorus

loading and true mean and maximum chlorophyll-a concentrations is not able to provide reliable information. Remedial measures may be taken to reduce external phosphorus loads, thus resulting in the reduction of long-term mean and maximum open-water summer chlorophyll-a concentrations. However, perturbations in phytoplankton biomass will still remain at such a level that short-term algal blooms or scums on any particular day may still be sufficiently intense for long-term improvements not to be deemed significant to the occasional recreational user of the water body. (Baker-FRC)
W81-02856

AFFINITY TESTS FOR THE DETECTION OF COMMUNITY ALTERATION IN PLANKTON: EVALUATION WITH A DISTRIBUTIONAL COMPUTER MODEL,
Georgia Univ., Athens. Dept. of Geology.
W. B. Hayes.
Environmental Pollution (Series B), Vol 1, No 2, p 127-148, 1980. 5 Fig, 8 Tab, 17 Ref.

Descriptors: *Phytoplankton, *Biological communities, *Computer models, Thermal stress, Model studies, Analytical techniques, Plankton, Fager test, Orloci test, Affinity testing, Sampling, Ecological distribution, Stochastic processes, Statistical methods, Temperature effects, Water pollution effects, Pollutant identification.

The Fager recurrent group analysis was found superior to the Orloci n-dimensional clustering procedure in environmental monitoring of a complex plankton community undergoing thermal stress. Although both affinity tests performed equally well in a model community study, the Fager method gave better results where repetitive samples were taken during a control-to-outfall transect, commonly employed in field studies. A spatial distribution model of species within the phytoplankton community was constructed by computer with built-in stochastic temporal community variations. The use of affinity tests can detect small changes in species variation, since all species are considered, not only indicator organisms. (Cassar-FRC)
W81-02860

ALGAL RESPONSE TO COPPER UNDER RIVERINE CONDITIONS,
State Univ. of New York Coll. at Buffalo. Dept. of Biology.
R. L. Klotz.
Environmental Pollution (Series A), Vol 24, No 1, p 1-19, January, 1981. 3 Fig, 12 Tab, 29 Ref.

Descriptors: *Algae, *Rivers, *Industrial wastes, *Copper, *Toxicity, Effluents, Chlorella, Scendesmus, Chlamydomonas, Water pollution sources, On-site data collection, Heavy metals, Metals, Absorption, Aquatic algae, Water pollution effects, Furnace Brook, *Connecticut.

Algae (Chlamydomonas sp., Scenedesmus sp., and Chlorella sp.) were grown in dialysis chambers immersed in Furnace Brook, Connecticut, for periods of a week throughout the year to determine the effects of a copper-containing effluent discharged from an upstream factory. Growth rates were highest in summer in spite of the highest Cu levels (135-687 micrograms per liter) and were correlated with temperature but not with dissolved Cu concentration of the water. Final Cu concentration in the cells ranged from 0 to 22.0 mg per g dry weight. Cu uptake rates were highest at optimal temperatures, which varied with species and Cu concentration. Algae in this river were tolerant of copper. (Cassar-FRC)
W81-02862

THE EFFECT OF A FLUORIDE EFFLUENT ON MARINE ORGANISMS,
Otago Univ., Portobello (New Zealand). Marine Lab.
N. W. Pankhurst, C. R. Boyden, and J. B. Wilson.
Environmental Pollution (Series A), Vol 23, No 4, p 299-312, December, 1980. 1 Fig, 6 Tab, 20 Ref.

Descriptors: *Marine organisms, *Toxicity, *Fluroides, Water pollution effects, *Industrial wastes, Effluents, Water pollution sources, Discharge(Water), Waste water disposal, Fertilizers, Mussels, Aquatic animals, Fish, Sole, Anemone, Cockle, Brine shrimp, Invertebrates, Shellfish, Fertilizer plant, *New Zealand.

Fluoride-containing effluent from a New Zealand fertilizer plant affected the distribution and abundance of marine organisms near the outfall. Encrusting fauna were counted in February and March 1978 at 18 stations 1 to 400 meters north of the outfall and at 2 stations 400 and 450 meters south of the outfall. Immediately adjacent to the outfall, no encrusting fauna were present. At 50 meters or less, relatively large numbers of bryozoans, ascidians, and bivalves were seen. Numbers increased toward the outer stations, with sponges, ascidians, and anemones appearing at a distance of 400 meters. Here only 1% of the rock examined was uncolonized. Additional counts in November-December 1978 and January 1979 showed similar patterns. Fluoride concentrations were high (10 ppm) in surface samples up to 10 meters from the outfall and dropped rapidly with distance to background levels. Sublethal toxicity tests on the brine shrimp, Artemia salina, showed adverse growth effects at all concentrations of fluoride, 5, 10, 15, and 20 ppm. After 12 days the controls reached a mean body length of 1.740 mm; those exposed to the highest fluoride concentration, 20 ppm, averaged 1.300 mm. Acute toxicity tests on 5 species revealed little mortality from 10 and 25 ppm F effluent or NaF solution, some mortality at 50 and 100 ppm NaF solution, and considerable mortality in all species at 50 and 100 ppm F effluent. (Cassar-FRC)
W81-02863

THE CHRONIC TOXICITY TO DAPHNIA MAGNA OF ACRIDINE, A REPRESENTATIVE AZAARENE PRESENT IN SYNTHETIC FOSSIL FUEL PRODUCTS AND WASTE WATERS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
B. R. Parkhurst, A. S. Bradshaw, J. L. Forte, and G. P. Wright.
Environmental Pollution (Series A), Vol 24, No 1, p 21-30, January, 1981. 6 Fig, 2 Tab, 12 Ref.

Descriptors: *Toxicity, *Daphnia, *Organic compounds, *Fuel, Synthetic fuels, Aquatic life, Invertebrates, Crustaceans, Acridine, Organic wastes, Water pollution sources, Water pollution effects, Azaarenes, Waste water, Reproduction, Pesticides.

The toxicity of acridine, an organic base present in synthetic fuel waste waters, was determined using first instar Daphnia magna. The 48 hour LC50 was 2.3 + or - 0.4 mg per liter. Chronic toxicity was judged by survival, occurrence of the primiparous instar, age at onset of reproduction, number of broods per female, number of young per brood, and total number of young per female. The estimated no-observed-effect concentration was 0.4 mg per liter; the lowest-observed-effect concentration 0.8 mg per liter. The least sensitive criterion was the occurrence of the primiparous instar; the most sensitive involved numbers of young and broods. Acridine was more toxic to Daphnia magna than most of the materials listed in a table of toxicities of organic acids, organic bases, and polyaromatic hydrocarbons found in sythetic fuel waste waters. However, its toxicity is less than that of the chlorinated hydrocarbon pesticides. (Cassar-FRC)
W81-02864

ENVIRONMENTAL IMPACT OF KRAFT PLANT EFFLUENTS ON SALMO SALAR OUANANICHE ANALYZED BY A NEW METHOD, THE COHERENCE GRAPH. (EVALUATION DES IMPACTS ENVIRONNEMENTAUX DUS AU REJETS D'UNE USINE DE PATE KRAFT SUR LE SALMO SALAR OUANANICHE A L'AIDE D'UNE NOUVELLE METHODE: LE GRAPHE DE COHERENCE),
Institut Nationale de la Recherche Scientifique Sainte-Foy (Quebec).
D. Couillard.
Environmental Pollution (Series B), Vol 2, No 2, p 145-161, 1981. 6 Fig, 2 Tab, 43 Ref.

Descriptors: *Paper pulp wastes, *Graphical analysis, Analytical techniques, Industrial wastes, Saw mills, Pulp and paper industry, Bleaching wastes, Water pollution sources, Phenols, Lakes, Canada, *Environmental effects.

A new approach based on graphs of coherence was evaluated for predicting the effect of a kraft pulp mill on water quality. Graphs of coherence were constructed to permit the systematic identification of the relationships between the mill and various components of the environment. A forestry complex consisting of a sawmill and kraft bleached pulp mill was established on the Chamouchouane River which flows into Lake St. John (Quebec, Canada). The graphs of coherence technique was applied to study the effects of the complex on lake species Salmo salar ouananiche. First, potential environmental impacts were determined, and second, the graph demonstrating the relationships between these impacts was constructed. This technique permits the rapid identification of serious environmental effects including avoidance effect, the presence of phenols, contact time, etc. (Small-FRC)
W81-02867

ACID LAKES FROM NATURAL AND ANTHROPOGENIC CAUSES,
Academy of Natural Sciences, Philadelphia, PA. Div. of Limnology and Ecology.
For primary bibliographic entry see Field 5B.
W81-02870

ISOLATION AND IDENTIFICATION OF AN AMES-MUTAGENIC COMPOUND PRESENT IN KRAFT CHLORINATION EFFLUENTS,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5A.
W81-02875

SOME ECOLOGICAL OBSERVATIONS ON ENVIRONMENTAL PARAMETERS, PLANKTONIC SEASONAL SUCCESSION AND BIOMASS IN RIO CRUCES (PROV. VALDIVIA), SOUTH CHILE,
Giessen Univ. (Germany, F.R.). Inst. fuer Pflanzenoekologie.
M. Durrschmidt.
Archiv fur Hydrobiologie, Vol 88, No 3, p 345-363, April, 1980. 9 Fig, 59 Ref.

Descriptors: *Phytoplankton, *Seasonal, *Algae, *Cruces River, *Chile, Diatoms, Biomass, Plankton, Fluctuations, Aquatic plants, Ecology, Rivers, Brackish water, Estuaries, Valdivia River, Chlorophyll, Chlorophyta.

Phytoplankton were observed monthly from May 1975 to April 1976 in the Cruces River, Chile, an area relatively uninfluenced by man's activities. The paper defines the composition, relative abundance and seasonal distribution of the algae to provide base information for future limnological investigations. A tremendous earthquake in May 1980 caused inundation of the last 35 km of the river. A total of 382 algal taxa were counted: Chlorophyta, 249; Bacillariophyceae, 76; Cyanophyta, 29; Chrysophyceae, 13; Euglenophyta, 14; and Xanthophyceae, 1. Chrysophyceae and diatoms increased rapidly in winter (June-Aug.). Spring saw a sharp decline in Chrysophyceae and a great increase in green algae, especially desmids. Diatoms and green algae again increased in summer (Nov.-Dec.). During Jan.-April (autumn) brackish water entered and algae species and numbers were reduced. Total algal cells reached a peak in June and in Nov./Dec. and a minimum in Sept. The algal flora was rich in species and poor in individuals. (Cassar-FRC)
W81-02876

PRIMARY PRODUCTION OF PHYTOPLANKTON AND ENVIRONMENTAL CHARACTERISTICS OF A SHALLOW QUATERNARY LAKE AT EASTERN BRAZIL,

Universidade Federal de Minas Geris, Belo Horizonte (Brazil). Dept. of General Biology.
F. A. R. Barbosa, and J. G. Tundisi.
Archiv fur Hydrobiologie, Vol 90, No 2, p 139-161, October, 1980. 9 Fig, 6 Tab, 51 Ref.

Descriptors: *Phytoplankton, *Distribution patterns, *Lakes, Nutrient requirements, *Brazil, Lake Carioca, Temperature, Light, Nutrients, Plankton, Aquatic life, Aquatic plants, Aquatic microorganisms.

Research was conducted at Carioca Lake, Eastern Brazil, concerning studies of the standing stock and primary production of phytoplankton and critical environmental factors which may control or limit it. The lake system studied is at an elevation of about 300 meters in a physiographic area known as the Interplanaltic Depression of River Doce. The air temperature averages from 20 to 22C. A rainy and a dry season can be distinguished, with an average yearly rainfall of 1500 mm. The lakes are situated in a tropical rain forest. Five lakes were chosen for a comparative limnological study. Higher levels of primary production were noted in winter, and diurnal cycles of certain environmental factors such as temperature appear to affect the population activities. A deoxygenated layer is marked off by the thermal discontinuity during the period of strong stratification. Vertical profiles of photsynthesis exhibit light inhibition at the surface. Primary production values ranged from 0.32 mg C/cubic meter to 108.8 mg C/cubic meter per day. In the summer the dark fixation values were high, ranging from undetectable up to 90%. Low photosynthetic efficiencies were recorded. It appeared that the factors affecting seasonal variations were mainly concerned with nutrient supply rather than light and temperature variations. The absence of a thermocline in the winter was probably responsible for higher levels of production due to nutrient enrichment of the euphotic zone by mixing. (Baker-FRC)
W81-02878

TEMPORAL PATTERNS IN RECOLONIZATION OF STREAM BENTHOS,

Scarborough Coll., Toronto (Ontario). Div. of Life Sciences.
D. D. Williams.
Archiv fur Hydrobiologie, Vol 90, No 1, p 56-74, September, 1980. 11 Fig, 37 Ref.

Descriptors: *Benthos, *Streams, *Temporal distribution, Aquatic life, Aquatic microorganisms, Biota, Benthic environment, Environmental effects, Seasonal distribution.

Recolonization by stream benthos was studied over a period of a year in efforts to detect patterns of movement resulting from interactions of both biotic and abiotic influences so as to provide information on the temporal nature of benthic communities. The study was made in a 15 m long riffle on the upper east branch of Duffin Creek, Durham County, Ontario. The depth varied between 20 cm in midsummer and 60 cm during the spring runoff. During the winter months relatively low numbers of individuals and species colonized the stream when compared to summer months. It is suggested that water temperature was the significant factor in this difference. A negative correlation was found between numbers of animals colonizing the stream each month and water depth. No correlation was noted with amounts of either fine particulate organic matter or coarse particulate organic matter, as it settled in the substrates. Some evidence was found of seasonal mobility that probably was associated with a specific stage in the life cycle of individual species. It is suggested that caution be applied in stream studies where artificial substrate techniques are used to collect information concerning species composition and the effects of pollutants. (Baker-FRC)
W81-02883

PHOSPHORUS, CHLOROPHYLL, AND EUTROPHIC LAKES,

Alberta Univ., Edmonton. Dept. of Botany.
M. Hickman.
Archiv fur Hydrobiologie, Vol 88, No 2, p 137-145, March, 1980. 2 Fig, 2 Tab, 28 Ref.

Descriptors: *Phosphorus compounds, *Chlorophyll, *Eutrophication, *Eutrophic lakes, Standing crops, Phytoplankton, Lakes, Alberta, Canada, Oligotrophy, Model studies, Regression analysis, Trophic level, Nutrients.

The curvilinear regression equation, log chlorophyll a concentration = 3.27 log (log phosphorus concentration) + 0.542, was developed to predict summer phytoplankton standing crop size from measurements of total phosphorus concentration at spring overturn. This model applies to a wide range of lakes, from oligotrophic to eutrophic. The data used to derive the equation were collected from 12 eutrophic lakes in Alberta, Canada. However, in extremely eutrophic lakes with large standing crops, the physical factors of temperature, irradiance, and turbulence become increasingly important. (Cassar-FRC)
W81-02886

THE DISTRIBUTION OF THE POLYCHAETE CAPITELLA CAPITATA (FABRICIUS) IN DOCK SEDIMENTS,

Liverpool Polytechnic (England). Dept. of Biology.
C. J. James, and R. Gibson.
Estuarine and Coastal Marine Science, Vol 10, No 6, p 671-683, June, 1980. 4 Fig, 5 Tab, 38 Ref.

Descriptors: *Heavy metals, *Polychaetes, *Bioindicators, *Sediments, Benthic fauna, Capitella capitata, Invertebrates, Worms, Annelids, Water pollution effects, Docks, Metals, Copper, Zinc, Iron, Lead, Organic matter, Hydrogen sulfide, Sulfides, Mersey River, *Liverpool, England, Aquatic life.

The polychaete Capitella capitata appeared unaffected by heavy metal accumulations (all in parts per million: Cu 23.7, Fe 16, 368, Pb 327.8, and Zn 1089.6) in sediments of an enclosed non-tidal dock at Liverpool, England. Water in this area was subject to contamination by untreated sewage from a night club and spillage from gravel, sand, and molasses loading. A total of 1204 specimens from 13 species of invertebrates (Annelida and Arthropoda) were collected in the dock area. Species diversity was low, and Capitella accounted for 88.5% of the total animals. Polychaeta as a group were 95.5% of all fauna collected. Capitella was more prevalent in coarse sandy sediments (subject to mechanical instability, low levels of organic matter and high levels of heavy metals) than in the silt (stable, low oxygen, high organic matter and sulfides). (Cassar-FRC)
W81-02887

EVIDENCE FOR THE INCREASED EUTROPHICATION OF LAKE NAINITAL AS A RESULT OF HUMAN INTERFERENCE,

Kumaun Univ., Naini Tal (India). Dept. of Zoology.
M. C. Pant, A. P. Sharma, and P. C. Sharma.
Environmental Pollution (Series B), Vol 1, No 2, p 149-161, 1980. 4 Fig, 3 Tab, 43 Ref.

Descriptors: *Eutrophication, *Lakes, *Ecology, *Lake Nainital(India), Aquatic life, Water pollution effects, Nitrates, Nitrogen compounds, Phosphates, Phosphorus compounds, Environmental effects, Algae, Zooplankton, Invertebrates, Dissolved oxygen, Bioindicators, India.

The rapid eutrophication of Lake Nainital, India, was documented by measuring water quality parameters during September 1977-August 1978 and comparing results with historical data and indicators of eutrophication. Current observations, with 1954 data, if available, in parentheses, are as follows: Secchi transparency, 75-194 cm; dissolved oxygen in surface waters, 5.65-17.2 mg per liter; pH, 7.0-9.6; alkalinity, 110-520 ppm; total hardness, 400 ppm (300 ppm); ammonia N, 33-422 micrograms per liter (19.0); nitrate-N, 62.5-750 micrograms per liter (traces in 1954); and phosphate, 6.5-70 micrograms per liter. Biological indicators of eutrophication include the presence of Tubifex spp., Chironomus spp., Microcystis sp., and zooplankton common in eutrophied lakes. Bottom fauna are completely absent, as is the dinoflagellate Ceratium hirundinella. Both physico-chemical and biological criteria indicate that this lake is undergoing rapid eutrophication. (Cassar-FRC)
W81-02890

NON-RADIOLOGICAL ENVIRONMENTAL IMPLICATIONS OF NUCLEAR ENERGY,

Biswas and Associates, Oxford (England).
A. K. Biswas.
Environmental Conservation, Vol 7, No 3, p 229-237, Autumn, 1980. 1 Fig, 1 Tab, 48 Ref.

Descriptors: *Thermal water, *Powerplants, *Thermal pollution, *Nuclear powerplants, Temperature effects, Environmental effects, Aquatic life, Foreign projects, Ecosystems.

Thermal pollution caused by nuclear energy power plants may affect water-based ecosystems. Most experimental studies do not indicate major impacts such as massive fish kills, but the combined effects of pollutants and heat could be serious. Chemicals used to control corrosion, neutralize pH, or control biological fouling are often discharged into the water. Heat may also affect organisms' response to irradiation. Studies have shown that radiation damage is greater in animal cells also exposed to heat. There is some data on the possible benefits of thermal discharges. Possible uses are aquaculture and agriculture, space heating, industrial uses, and irrigation use. Increases in water temperature have been found to increase growth rates of shrimp, catfish, oysters, and other creatures. Heated irrigation water can prolong the growing season and prevent damage by early or late frosts. Land use impacts are also discussed. (Small-FRC)
W81-02895

USE OF SYNTHETIC DETERGENTS IN MALAYSIA,

Malaya Univ., Kuala Lumpur (Malaysia).
M. A. Quddus.
Environmental Conservation, Vol 7, No 4, p 287-288, Winter, 1980. 2 Ref.

Descriptors: *Detergents, *Malaysia, *Eutrophication, Phosphates, Lakes, Water pollution sources, Phosphorus compounds, Foreign countries, Water pollution control, *Water pollution effects.

Rising use of synthetic phosphate-containing detergents in Malaysia has been responsible for eutrophication of Taman Jaya, a lake in the suburban area of Kuala Lumpur. Although no eutrophication studies have defined the state of Malaysia's waters, it is believed that phosphates from laundry water, untreated sewage, industry, and agriculture are producing an enormous phosphate load. It is recommended that in developing countries phosphates be banned or their percentage lowered in detergents, since even primary sewage treatment facilities are minimal. (Cassar-FRC)
W81-02896

5D. Waste Treatment Processes

PROCESS FOR REMOVAL OF DISCRETE PARTICULATES AND SOLUTES FROM LIQUIDS BY FOAM FLOTATION,

J. H. Hoge, and J. H. Hubbard.
U.S. Patent No 4,203,837, 15 p, 13 Fig, 11 Ref; Official Gazette of the United States Patent Office, Vol 994, No 3, p 985, May 20, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Separation techniques, Foam separation, Surfactants, Bubbles, Floating, Absorption, Pregenerated foam.

A process removes discrete particulates from liquids by foam flotation which is readily adaptable to continuous or batch processing. A continuous stream of foam, in which the gaseous medium is subdivided into individual bubbles, each encapsulated in a film consisting of a foaming agent solution, each film being shared with each adjacent gas cell, is pregenerated. The composition of the films of the pregenerated foam may include, in addition

to the foaming agent, other agents or reagents useful or necessary for the collection and removal of the solid or solute material being extracted by counter ion action. The pregenerated foam is then introduced at a predetermined rate into the liquid carrying the solids or solutes and is dispersed. The preformed surfactant films of the bubbles contact and attach the solid particles by counter ion action from the liquid during the progress of the foam bubbles through the liquid. The loaded foam bubbles are allowed to float to the surface where they consolidate into a stable foam layer for convenient removal. Dissolved materials in the liquid body are similarly extracted by use of film having composition suitable for ionic adsorption or reagents for precipitation of the soluble material on or within the film. (Sinha-OEIS)
W81-02660

A SOLAR HEATED FISH HATCHERY WATER RECYCLING SYSTEM,
Sea Run, Inc., Kennebunkport, ME.
For primary bibliographic entry see Field 8I.
W81-02709

ADVANCED PRETREATMENT PROCESS FOR WASTE WATER REUSE USING REVERSE OSMOSIS,
FilmTec Corp., Minneapolis, MN.
R. J. Petersen, R. S. King, C. R. Bennett, and J. E. Cadotte.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-197600, Price codes: A05 in paper copy, A01 in microfiche. Office of Water Research and Technology Report OWRT/RU-80/3, September, 1980. 81 p, 25 Fig, 33 Tab, 15 Ref. OWRT-C-80274-R(No 8804)(1), 14-34-0001-8804.

Descriptors: *Water reuse, Waste water renovation, *Membrane processes, *Reverse osmosis, Ultrafiltration, Waste water treatment, Oil wastes.

Colloidal and dissolved organic matter was shown to be a primary foulant in reverse osmosis treatment of wastewaters for reuse. A two-phase study was conducted on pretreatment methods to remove these organic foulants. In the first phase, river water and petroleum refinery effluent were treated with inorganic coagulants (ferric chloride and alum) under a variety of conditions. The clarified waters were then tested for fouling potential in reverse osmosis, at high membrane fluxes (25 to 35gfd) to accentuate fouling rates. Fouling flux decline was nearly always encountered; also, organic removal was ineffective. In Phase II, a novel set of thin film composite ultrafiltration membranes were developed. These consisted of anionic methyl cellulose graft copolymers deposited as membranes on microporous supports. These membranes removed organic foulants from river water and petroleum refinery effluent, and were fairly effective on municipal secondary effluent in ultrafiltrations at 50 psi.
W81-02710

USE OF CALCIUM STRIPPING COLUMN TO ACHIEVE ENERGY CONSERVATION AND RESIDUE REUSE IN PHOSPHATE PRECIPITATION BY LIME,
Missouri Univ.-Rolla. Dept. of Civil Engineering.
J-C. Huang, Y. A. Sun, and C. S. Liu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-197634, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, University of Missouri, Completion Report, November, 1980. 47 p, 12 Fig, 11 Tab, 6 Ref. OWRT-A-109-MO(1), 14-34-0001-9027 & 0127.

Descriptors: Calcium carbonate, *Chemical precipitation, Fluidized beds, *Hydroxylapatite, Lime, *Phosphorus removal, *Water pollution control, *Waste treatment.

This study was undertaken to evaluate the feasibility of using a fluidized sand bed to coprecipitate the insoluble phosphorus complex of hydroxylapatite with calcium carbonate on the surface of sand grains to form dry chemical pebbles. It was found that the operation of such a new technique was simple and it required a contact time of only 5 min. At pH 10.0, the concentration of P in raw sewage was reduced from 8 mg/L to about 3 mg/L. Also, about 50 to 70% of calcium carbonate was able to plate out on the surface of sand grains. If the influent was allowed to settle for 1 hr, the residual P was further reduced to 1 mg/L, and most of the remaining suspended solids could settle out effectively.
W81-02713

SURVEY AND CONTROL OF SYNTHETIC ORGANICS IN TEXAS WATER SUPPLIES,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 5A.
W81-02719

THE EFFECT OF HEAVY METALS ON THE PERFORMANCE OF ROTATING BIOLOGICAL CONTACTORS (RBC),
Oklahoma State Univ., Stillwater.
F. G. Dehkordi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198434, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, July, 1980. 51 p, 21 Fig, 9 Tab, 31 Ref. OWRT-A-087-OKLA(3).

Descriptors: *Biological waste water treatment, *Waste water facilities, *Water quality control, *Heavy metals, *Chemical oxygen demand, Waste water, Sewage, Waste water purification, Waste water treatment, Biological treatment, Sludge seeding, Biodegradation, Treated water, Water treatment, Research priorities, Evaluation, Chromium, Copper, Trace metals, Water pollution control.

Addition of hexavalent chromium (Cr) in the form of potassium chromate at concentrations of 1, 2, and 3 milligrams/liter (mgpl) did not decrease chemical oxygen demand (COD) removal efficiency of the rotating biological contactors (RBC) employed, but Cr at 20 mgpl did. When the RBC recieved wastewater containing potassium dichromate it removed 65-80% metal at concentrations of 1,2,3, and 20 mgpl. Hexavalent Cr (as the chromate salt) at 1-4 mgpl did not affect COD removal efficiency of the RBC. Removal efficiency of the chromate salt by the RBC was almost 100% at 1-2 mgpl, but only 68 and 62% of the Cr was removed at 3 and 4 mgpl, respectively. When hexavalent Cr was fed to the RBC in both salt forms, microbial growth was stimulated on the rotating discs relative to control conditions. RBC receiving waste waters containing copper (cupric sulfate) had higher COD removal efficiency at hydraulic loadings of 0.7 and 3 gallons/day/square-foot relative to the control, with copper removal considerably higher at the latter hydraulic loading. (Zielinski-IPA)
W81-02723

HOOVER DAM ADVANCED WASTE TREATMENT SYSTEM; VOLUME I, PILOT STUDIES REPORT.
Montgomery (James M.), Inc., Pasadena, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-180309, Price codes: A12 in paper copy, A01 in microfiche. Water and Power Resources Service, Boulder City, Nevada, Report, January, 1981. 257 p, 52 Fig, 79 Tab, 4 Append. 9-07-30-V0471.

Descriptors: *Waste water treatment, *Advanced waste water treatment, *Reverse osmosis, *Recreation wastes, Coagulation, Flocculation, Biological waste water treatment, Sedimentation, Filtration, Effluent limitations, Fouling, Hoover Dam, Pilot plants.

The advanced waste treatment plant at Hoover Dam is a facility capable of producing a high quality effluent. Included among the unit processes are a conventional activated sludge process, lime clarification, dual media filtration, cartridge filtration, and reverse osmosis. The objectives of the study were: to operate the treatment plant to produce an effluent of sufficient quality to satisfy stringent effluent discharge requirements; and to conduct performance tests of the reverse osmosis unit. The waste water can be classified as a dilute sanitary waste with extreme diurnal flow variations, typical of a facility which would be visited by a large number of tourists. Six treatment trains were evaluated in a bench-scale test program, and based on this data, two treatment trains were analyzed in full-scale tests. Treatment train No. 1 comprised secondary biological treatment; lime coagulation, flocculation and sedimentation; dual media pressure filtration, cartridge filtration; and reverse osmosis. Treatment train No. 2 comprised lime coagulation, flocculation and sedimentation of raw sewage; dual media pressure filtration; cartridge filtration; and reverse osmosis. Both treatment trains were capable of meeting the proposed stringent effluent discharge requirements. Uncontrolled biological growth in the reverse osmosis system presented problems in both treatment trains. Thin film composite polyamide membranes performed better than cellulose acetate membranes in the reverse osmosis unit as part of the second phase operation of treatment train No. 1. (Moore-SRC)
W81-02772

HOOVER DAM ADVANCED WASTE TREATMENT SYSTEM: VOLUME II, PILOT STUDIES SUMMARY DATA.
Montgomery (James M.), Inc., Pasadena, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-180317, Price codes: A13 in paper copy, A01 in microfiche. Water and Power Resources Service, Boulder City, Nevada, Report, January, 1981. 222 p, 14 Tab. 9-07-30-V0471.

Descriptors: *Advanced waste water treatment, *Waste water treatment, *Reverse osmosis, Recreation wastes, Filtration, Coagulation, Sedimentation, Flocculation, Biological waste water treatment, Turbidity, Particulate matter, Fouling, Hoover Dam, Pilot plants.

The objectives of this study were to operate the Hoover Dam Advanced Waste Treatment plant to produce an effluent of suffient quality to satisfy stringent effluent discharge requirements and to conduct performance tests of the reverse osmosis unit. This volume of the report provides tables of summarized data collected during full scale plant operation. Treatment train No. 1 comprised secondary biological treatment; lime coagulation, flocculation and sedimentation; dual media pressure filtration; cartridge filtration; and reverse osmosis. Treatment train No. 2 comprised lime coagulation, flocculation and sedimentation of raw sewage; dual media pressure filtration; cartridge filtration; and reverse osmosis. The data are presented in three sections corresponding to the chronological order in which the project was conducted. Section I contains information from the operation of treatment train No. 2 with cellulose acetate membranes in the reverse osmosis unit. Section II contains data from the operation of treatment train No. 1 with cellulose acetate membranes in the reverse osmosis unit. Section III contains information from the operation of both treatment trains with a combination of cellulose acetate and thin film composite polyamide membranes in the reverse osmosis unit. Data on turbidity, particle count, plugging index, unit process performance, and system performance are included. (Moore-SRC)
W81-02773

LABORATORY AND FIELD EVALUATION OF NS-100 REVERSE OSMOSIS MEMBRANE,
Abcor Inc., Wilmington, MA. Walden Div.
K. J. McNulty, D. C. Grant, J. R. Harland, and R. L. Goldsmith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-186026, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-059, April, 1980. 35 p, 11 Fig, 1 Tab, 6 Ref. R803753.

Descriptors: *Reverse osmosis, *Semipermeable membranes, *Metal-finishing wastes, *Zinc cya-

nide, Alkalinity, Deterioration, Waste water treatment, Water pollution control, Field tests, Evaluation, Membranes.

In an attempt to extend the applicability of reverse osmosis (RO) to the high-pH cyanide rinsewaters, laboratory life tests were conducted with B-9 and NS-100 RO membranes treating zinc cyanide plating solution at 10% of bath strength. The B-9 membrane was degraded by the high pH of the solution which was beyond the upper pH limit (pH 11) recommended for this membrane. The NS-100 membrane showed little deterioration in performance over the first 500 h of operation. A reduction in permeate flux and rejection after 500 h appeared to be due to precipitation of salts which resulted from operation in the closed loop test system and would not be expected in actual field operation. Field tests were conducted at New England Plating Company treating rinsewater from the zinc cyanide plating operation with a module of seven tubular NS-100 RO membranes. Conductivity rejections of 80-96% and zinc rejections of 96-99.7% were measured at flux levels of 0.20-0.37 cu m/sq m/day (5-9 gal/sq ft/day). During 2300 h of exposure to the rinsewater, the membrane showed no degradation in performance as determined by NaCl performance tests and standard tests with a solution of zinc cyanide plating bath diluted to 5% of bath strength. A number of attempts were made to fabricate an NS-100 spiral-wound module, but all were unsuccessful. Further development will be required before the NS-100 can be commercially offered in an economically attractive configuration. (Brambley-SRC)
W81-02777

OVERLAND FLOW: REMOVAL OF TOXIC VOLATILE ORGANICS,
Cold Regions Research and Engineering Lab., Hanover, NH.
T. F. Jenkins, D. C. Leggett, C. J. Martel, and H. E. Hare.
Army Corps of Engineers Special Report 81-1, February, 1981. 19 p, 6 Fig, 10 Tab, 33 Ref, 1 Append.

Descriptors: *Overland flow, *Chlorinated hydrocarbons, *Waste water treatment, Municipal waste water, Volatility, Chlorination, Disinfection, Mathematical models, Kinetics.

Chlorine disinfection of water and wastewater produces a number of volatile organics of which haloforms are the volatile organochlorine compounds produced in highest concentration. A small-scale overland flow system was studied to determine its effectiveness in reducing the levels of volatile trace organics in municipal waste water. The prototype system is 30.5 m in length by 8.8 m wide, and was subdivided into three parallel test sections. Waste water was applied at five different rates ranging from 0.40 to 1.32 cm/hr. The period of application was generally seven hours a day, five days per week. Chlorinated primary waste water, water collected from the surface at various points downslope, and runoff were analyzed by gas chromatography/mass spectrometry using a purge and trap sampler. The results indicated that overload flow was effective in reducing the levels of these substances by 80-100% depending on the specific substance and the application rate. The removal mechanism was found to follow first order kinetics. The most likely mechanism to explain the observed behavior is volatilization. Comparison of the experimental results with theoretical prediction using published models resulted in reasonable agreement, considering the complexity of the system compared to the model systems. (Moore-SRC)
W81-02779

CAPROLACTAM RECOVERY FROM AQUEOUS MANUFACTURING STREAMS,
Union Carbide Corp., Tarrytown, NY.
J. H. Dibble.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-197999, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-062, April, 1980. 56 p, 15 Fig, 9 Tab, 8 Ref, Append, R-803737.

Descriptors: *Waste water treatment, *Industrial waste water, *Process water, *Waste recovery, *Pilot plants, Organic solvents, Effluent streams, Conservation, Adsorption, Physical properties.

A pilot plant was developed from the laboratory scale process for caprolactam recovery from aqueous wash streams. Caprolactam is extracted by dodecylphenol, a high-boiling solvent, and recovered from the extract by distillation. The resulting aqueous effluent caprolactam concentrations were as low as 30 ppm. Further treatment by activated carbon adsorption reduced the level to less than 2 ppm. Various physical properties, which are needed for this process design, were determined. Vapor pressures for the key components were determined using a special high-temperature, low-pressure (vacuum) apparatus. Other properties investigated include: density; solubilities of water in dodecylphenol and dodecylphenol in water; the interfacial tension of the water-caprolactam-dodecylphenol system; and the viscosities of pure dodecylphenol and dodecylphenol-heptane systems. This process is more efficient in extraction and less energy-consuming than current commercial processes. (Brambley-SRC)
W81-02783

THE FEASIBILITY OF A REGIONAL INDUSTRIAL WASTE WATER TREATMENT FACILITY,
Datagraphics, Inc., Pittsburgh, PA.
H. C. Bramer, and C. A. Caswell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-195787, Price codes: A05 in paper copy, A02 in microfiche. Environmental Protection Agency Report EPA-600/2-80-065, April, 1980. 76 p, 5 Fig, 21 Tab, 74 Ref, 1 Append. R804182.

Descriptors: *Waste water treatment, *Industrial waste water, *Waste water facilities, *Feasibility studies, *Monongahela River, Pennsylvania, Industrial plants, Sewer systems, Process water, Cooling water, Costs, Water quality standards.

The feasibility of establishing a regional industrial waste water treatment facility to serve the 68 industrial plants along the lower reaches of the Monongahela River, Pennsylvania, has been studied. A facility consisting of an interceptor sewer system following the river course with a treatment plant near the point at Pittsburgh is technically possible. The facility would best be designed to treat up to 568,000 cu m/day (150 mgd) of waste water consisting of 10% of the presently discharged process water and 10% of the presently discharged unsegregated, non-contact cooling water. The construction and operation would be best handled by the Allegheny County Sanitary Authority and funded by revenue bonds backed by long-term contracts from industrial users. Obstacles to the implementation of the scheme include the lack of effluent guidelines, and cost to and unwillingness to make long-term commitments by industry. While such a facility in this area is technically possible, it is neither economically nor institutionally feasible. (Brambley-SRC)
W81-02786

MULTI STAGE FLOCCULATION TREATMENT SYSTEM,
Houdaille Industries, Inc., Fort Lauderdale, FL.(Assignee).
M. G. Mandt.
U S Patent No 4,206,052, 10 p, 3 Fig, 4 Tab, 3 Ref; Official Gazette of the United States Patent Office, Vol 995, No 1, p 228, June 3, 1980.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Flocculation, Coagulation, Chemical reactions, Mixing, Turbulence, Hydrostatic pressure.

A system is described for flocculation processing in water purification treatment in which a first jet flash mixing field of relatively high specific energy requirement and turbulence intensity is provided for intimate mixture of the flocculant and influent water to produce a thoroughly mixed product stream having residual energy, and in which the product stream from the first mixing field is used as the motive stream to power a flocculation field of lower specific energy requirement and turbulence intensity. (Sinha-OEIS)
W81-02805

THE EFFECT OF PH ON THE COAGULATION AND PURIFICATION OF WASTEWATER,
Ministry of Works and Housing, Ibadan (Nigeria).
C. M. A. Ademoroti.
Effluent and Water Treatment Journal, Vol 20, No 11, p 541, 544-546, 549, November, 1980.

Descriptors: *Water purification, Acidity, *Coagulation, *Alum, Waste water treatment, *Ferric chloride, Water treatment, Water quality control, Waste treatment, Water pollution treatment, *Hydrogen ion concentration.

Alum and ferric chloride were used for the coagulation of wastewater. Two sets of samples were coagulated with 100, 200, 300, 400, 500 or 600 mg/l alum and with 50, 100, 200, 300, 400, and 500 mg/l ferric chloride. They were filtered through sand, and the effluents were analyzed. The doses giving the highest reductions in color, suspended solids, BOD and COD were 400 mg/l alum and 300 mg/l ferric chloride. When pH values were adjusted to 4.8, purest effluents were obtained at 200, 300 and 400 mg/l ferric chloride, as shown by COD values. Ferric chloride proved effective at lower concentrations than alum. The effluents of both coagulants were generally acidic in character, and the attainment of pH 4.8, where coagulation was optimum, created a medium for effective disinfection performance by hydrochlorous acid, an active species obtained during chlorination. The method of wastewater treatment by coagulation is simple and can be a suitable alternative for the secondary treatment in conventional methods of treatment. (Baker-FRC)
W81-02832

MODELING SEWAGE SLUDGE DECOMPOSITION IN SOIL: 1. ORGANIC CARBON TRANSFORMATION,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soils and Crops.
Y. P. Hsieh, L. A. Douglas, and H. L. Motto.
Journal of Environmental Quality, Vol 10, No 1, p 54-59, January-March, 1981. 5 Fig, 3 Tab, 20 Ref. OWRT-A-038-NJ(4).

Descriptors: *Sewage sludge, *Degradation, *Model studies, Sludge treatment, Regression analysis, Biodegradation, Laboratory tests, Recycling, Waste treatment, Soil amendments, Activated sludge, Organic matter, Loam, Carbon.

To ensure beneficial results of waste recycling on agricultural land, the decomposition patterns of different types of sewage sludge in various soils should be examined under a number of environmental conditions. Laboratory mineralizations of an activated and a digested sludge were carried out in brown bottles, and decomposition was monitored through CO2 evolution measured by a modified biometer system. Greater mineralization was observed in the activated sludge than in the digested sludge due to its high active organic carbon content. After approximately 2 months, the mineralization rates of both sludges approached a square foot function of time. At 22 degrees, the mineralization of sewage sludges was found to be proportional to the application rate. At 8-22 degrees, the mineralization rate increased about 1.9 times for each 10 degree increase in temperature. Moisture levels of 0.06-0.33 bars had no significant effects on the mineralization rates of the sludges. A regression model was devised utilizing an exponential relationship of the cumulative organic carbon mineralized to the parameters of time, sludge rate and temperature. Due to its simplicity, the model may readily be applied to simulation analyses of sewage sludge decomposition in soil under various environmental conditions. (Geiger-FRC)
W81-02837

MODELING SEWAGE SLUDGE DECOMPOSITION IN SOIL: II. NITROGEN TRANSFORMATIONS,

Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soils and Crops.
For primary bibliographic entry see Field 5E.
W81-02838

EVIDENCE FOR COMETABOLISM IN SEWAGE,
Cornell Univ., Ithaca, NY. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W81-02849

THE COMPARISON OF SOY-BEAN WASTES, USED TEA LEAVES AND SEWAGE SLUDGE FOR GROWING CHLORELLA PYRENOIDOSA,
Chinese University of Hong Kong, Shatin. Dept. of Biology.
M. H. Wong, and C. C. Lay.
Environmental Pollution (Series A), Vol 23, No 4, p 247-259, December, 1980. 9 Fig, 3 Tab, 19 Ref.

Descriptors: *Agriculture, *Algae, *Sludge, Nutrients, Metals, Organic matter, Industrial wastes, *Chlorella, Growth rates, Cultures, Waste water treatment, Activated sludge, Sewage sludge, Copper, Lead, Manganese, Iron, Trace elements, Heavy metals, *Soybean wastes, *Tea leaf wastes.

Chlorella pyrenoidosa, a unicellular green alga, was cultured in aqueous extracts of sewage sludge, soybean residues, and used tea leaves. The 2% soybean residue extract produced the highest growth rate, followed by 2% sludge extract, Bristol medium (control), and 1% tea leaves extract. Algal cells cultured in sludge extract contained higher levels of metals, Cu 0.06 mg per g, Mn 0.08 mg per g, and Fe 13.9 mg per g, than the soybean and Bristol medium substrates. Although the sewage sludge was of domestic water rather than industrial waste origin, it inhibited algal growth for the first few days. Studies of effects of metal concentrations on growth rates of algae showed that low levels accelerated growth but higher levels were inhibitory. The studies of effects of pH on growth rate showed that pH 7 supported better growth than pH 6.4. In more acidic media such as used tea leaf extract, growth was poor and trace metal solubilities enhanced, in spite of the presence of essential nutrients. (Cassar-FRC)
W81-02861

CLAY IS MOSINEE'S CHOICE FOR REDUCING TSS DISCHARGE FROM CLARIFIER,
Wisconsin Univ., Stevens Point. Dept. of Paper Science and Engineering.
J. M. Lassa.
Tappi, Vol 64, No 3, p 181-182, March, 1981. 1 Fig, 1 Tab.

Descriptors: *Pulp wastes, Clays, Polymers, *Suspended solids, *Waste water treatment, Mosinee Paper Corporation.

Clay was the most cost-effective and efficient additive for reducing total suspended solids in effluent from the secondary clarifier at Mosinee Paper Corporation's kraft mill. Other additives used in jar tests were alum, coal boiler fly ash, and commerical polymers (strongly anionic, moderately anionic, strongly cationic, nonionic, and cationic weighting agent). Optimum dosage was 10 ppm or 83.4 lb per million gal of secondary waste water. The Mosinee Mill treatment plant treats 12 million gal per day of waste water. (Cassar-FRC)
W81-02874

PHOSPHATE REMOVAL WITH CALCIUM CARBONATE PRECIPITATION IN THE LAKE OF CONSTANCE (OBERSEE). (PHOSPHATELIMINATION DURCH AUTOCHTHONE CALCITFALLUNG IM BODENSEE-OBERSEE),
Staatliches Inst. fuer Seenforchung und Fischereiwesen, Langenargen (Germany, F. R.).
H. Rossknecht.
Archiv fur Hydrobiologie, Vol 88, No 3, p 328-344, April, 1980. 3 Fig, 5 Tab, 17 Ref.

Descriptors: *Phosphorus, *Calcium carbonate, *Chemical precipitation, *Water pollution control, Lakes, Heavy metals, Acids, Separation techniques, Water treatment, Germany, Lake of Constance(Obersee).

The extent of phosphate coprecipitation in calcite was investigated because precipitation with $CaCO_3$ can be used to remove organic acids or heavy metals from lake water. The phosphate content in the suspended matter and in the calcareous crusts on the leaves of Potamogeton lucens was determined by disintegrating the particles with carbon dioxide. Also, the phosphorus coprecipitation rate was measured in $CaCO_3$ precipitation experiments with supersaturated lake water and $Ca(HCO_3)_2$ solutions. The concetration of particulate $CaCO_3$ was determined in 1975 through 1978 in Lake Constance water, and the data were used to estimate the epilimnetic $CaCO_3$ production. The amount of phosphorus eliminated by the lake's self-cleaning mechanism was estimated. (Small-FRC)
W81-02882

INDUSTRIAL WASTEWATER VS. THE POTW,
Black and Veatch Kansas City, MO.
J. Stukenberg, and J. D. Copeland.
American City and County, Vol 96, No 1, p 41-43, January, 1981. 1 Tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Design criteria, Activated sludge, Municipal wastes, Treatment facilities, Cities, North Kansas City, *Missouri.

Existing municipal waste water treatment works (publicly owned treatment works, POTW) can successfully accommodate additional industrial waste water or upgrade the effluent quality with appropriate modifications. This is especially desirable when the industries provide substantial employment for the local residents. An example is given featuring North Kansas City, Missouri, population 6,000 people and 20 industries. The treatment plant had experienced problems with variable influent quality and corrosion by acid wastes. The design for the enlarged plant was based on analysis of plant records and data from the larger industrial dischargers. All plans were discussed with the industries, and most decided that discharge into the municipal plant without pretreatment would be economical. An oxygen activated sludge system, secondary clarifiers, and modifications to the sludge handling system were planned. Influent pH will be continually monitored. Along with the plant enlargement and modification, the testing laboratory will be expanded. (Cassar-FRC)
W81-02884

POLAND LAUNCHES MAJOR PROGRAM TO RESTORE AND REGULATE COUNTRY'S LARGEST RIVER SYSTEM,
E. Pudlis.
Ambio, Vol 10, No 1, p 41-43, 1981. 2 Fig.

Descriptors: *Poland, *Water resources development, *Rivers, *Vistula River, *Water pollution control, Planning, Water policy, Surface waters, Waste water treatment.

Poland has initiated a program to clean up and improve the Vistula River. Plans include 30 stages of locks and dams, 16 reservoirs with a total annual capacity of 6 billion cubic meters, and a number of hydroelectric power stations. The present heavily polluted condition of the river will be improved with 188 new large group purification plants (capacity 5.7 billion cu meters), 200 industrial treatment plants for processing particularly toxic sewage, and desalination facilities to mitigate salt leaching from coal mines. First signs of improvement in water quality are expected to be evident in 1990. (Cassar-FRC)
W81-02889

RECONSTRUCTION OF MALDON STW,
M. D. Elder, J. G. Evance, and D. J. Cooper.
Effluent and Water Treatment Journal, Vol 20, No 12, p 587-589, December, 1980. 2 Fig, 1 Tab.

Descriptors: *Sewage treatment, *Aeration, Waste water treatment, Biological treatment, Costs, Economics, *Estuaries, Odor, Aerated lagoons, Design criteria, Water pollution, Domestic wastes, Sewage sludge, Maldon, *Great Britain.

The town of Maldon on the estuary of the Blackwater supports various light industries and recreation through its boating facilities. Untreated sewage from the town found its way into the estuary and caused pollution and odor problems. In the 1960's, a biological filter installation was opened near Osea Island to handle flow from a population of 13,500. By 1969, the capacity of the plant had been exceeded. In 1974, a commission set up by the Essex Sewage Division studied the problem at Osea and reported on the options that might be taken within the appropriate cost limitations to upgrade the treatment of the town's waste water facilities to handle a population of 18,000. An extended aeration process was recommended which would reduce manpower requirements, eliminate odoriferous primary sludges, reduce fly nuisance, and allow disposal of a well oxidized sludge onto farm land. Design criteria were chosen and the uprated facility was located four kilometers from Maldon to serve the catchment area of Maldon and Heybridge. After 13 months of operation, the quality of the plant effluent has remained within the set standards and averages 11 milligrams/liter suspended solids and 7 milligrams/liter biochemical oxygen demand. Some minor problems have occurred with instrumentation and small trash deposition on sludge return valves, but these difficulties are being handled by further research. (Geiger-FRC)
W81-02899

5E. Ultimate Disposal Of Wastes

PERMEABILITY OF COVERS OVER LOW-LEVEL RADIOACTIVE-WASTE BURIAL TRENCHES, WEST VALLEY, CATTARAUGUS COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
D. E. Prudic.
Geological Survey Water-Resources Investigations 80-55, 1980. 35 p, 12 Fig, 4 Tab, 18 Ref.

Descriptors: *Permeability, Hydraulic conductivity, Porosity, *Infiltration, Atmospheric pressure, *Radioactive waste disposal, Soil water movement, Groundwater movement, Water levels, Groundwater recharge, Till, Hydrogeology, Evaluation, *New York, West Valley, Cattaraugus County, Burial trenches, Trench cover.

Among the facilities at the Western New York Nuclear Service Center, near the hamlet of West Valley in the northern part of Cattaraugus County, N.Y., is a State-licensed burial ground for commercial low-level radioactive wastes. The 11-acre burial ground contains a series of trenches excavated in a silty-clay till of low permeability that contains scattered pods of silt, sand, and gravel. Gas pressure in the unsaturated parts of radioactive waste burial trenches responds to fluctuations in atmospheric pressure. Measurements of atmospheric pressure and the differential pressure between the trench gas and the atmosphere on several dates in 1977-78 were used to calculate hydraulic conductivity of the reworked silty-clay till that covers the trenches. Generally the hydraulic conductivity of covers over trenches that had a history of rapidly rising water levels are higher, at least seasonally, than covers over trenches in which the water level remained low. This supports the hypothesis that recharge occurs through the cover, presumably through fractures caused by desiccation and (or) subsidence. Hydraulic conductivities of the cover as calculated from gas- and air-pressure measurements at several trenches were 100 to 1,000 times greater than those calculated from the increase in water levels in the trenches. This difference suggests that the values obtained from the air- and gas-pressure measurements need to be adjusted and at present are not directly usable in groundwater flux calculations. The difference in magnitude of values may be caused by rapidly decreasing hydraulic conductivity during periods of recharge or by the clogging of fractures with sediment washed in by runoff. (USGS)

W81-02692

EFFECTS OF FLY ASH HEAVY METALS ON DAPHNIA MAGNA,
Missouri Univ.-Kansas City. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W81-02715

WASTE WATER SPRAY TRANSPORT IN LAND APPLICATION,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 3F.
W81-02722

THE STATISTICAL DISTRIBUTION OF SEWAGE AND SLUDGE ANALYSES,
Oxford Univ. (England), Dept. of Agricultural Science.
For primary bibliographic entry see Field 5A.
W81-02817

ELEMENTAL CONTENT OF VEGETABLES AND APPLE TREES GROWN ON SYRACUSE SLUDGE-AMENDED SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Office of Occupational Health and Safety.
A. K. Furr, T. F. Parkinson, D. C. Elfving, C. A. Bache, and W. H. Gutenmann.
Journal of Agricultural and Food Chemistry, Vol 29, No 1, p 156-160, January-February, 1981. 6 Tab, 23 Ref.

Descriptors: *Heavy metals, *Soil amendments, *Absorption, *Sewage sludge, Vegetable crops, Apples, Fruit crops, Hydrogen ion concentration, Sludge treatment, *Fertilizers, Municipal wastes, Polarographic analysis, Syracuse, New York.

The magnitude of Cd, Cu, Ni, Pb, and Zn uptake by a variety of vegetables and apple trees grown in soils amended with municipal sludge at pH values of 6.4 and 6.9 was examined. Two successive crops of peppers, kohlrabi, lettuce, peas, spinach, sweet potatoes, and turnips and two commercial apple cultivars were grown in neutral or sludge-amended soils or their mixtures in pots under laboratory conditions. Analysis for the metals in the edible portion of the drops was performed by conventional stripping voltammetry. Cd, Cu, Ni, and Zn levels were higher in the edible portions of sludge-grown crops. Cd, Ni, and Zn were generally elevated in vegetable crops grown on sludge fortified acid soil. Cu was elevated in the vegetables raised on the sludge-neutral soil mixture. During the second year of growth, Ni and Zn were decreased in vegetable crops and apple trees grown on sludge amended soil. Variations of heavy metals in apple trees showed no consistent relationship with soil pH. Zn and Cu tended to concentrate in apple twigs, while Pb and Ni were found at concentrated levels in apple tree leaves. Since leafy vegetables such as lettuce or spinach absorb very high levels of Cd, Zn and Cu, the growth of these crops on municipal sludge amended soils should be avoided. (Geiger-FRC)
W81-02830

MODELING SEWAGE SLUDGE DECOMPOSITION IN SOIL: II. NITROGEN TRANSFORMATIONS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soils and Crops.
Y. P. Hsieh, L. A. Douglas, and H. L. Motto.
Journal of Environmental Quality, Vol 10, No 1, p 59-64, January-March, 1981. 3 Fig, 4 Tab, 25 Ref. OWRT-A-038-NJ(5).

Descriptors: *Denitrification, *Sewage sludge, *Model studies, Recycling, Soil amendments, Activated sludge, Sludge disposal, Nitrification, Nitrogen, Agriculture, Degradation, Kinetics, Laboratory tests, Sludge treatment, Organic matter.

The recycling of sewage sludge on agricultural land has been used as a method to ease some of the problems of sewage sludge disposal. The ability of soil to decompose sewage sludge was studied in laboratory tests. The transformation of nitrogen was studied in sandy loam soils amended with an anaerobically digested or an activated sewage sludge. The active organic carbon content and moisture level of the sludge-soil system was found to influence the duration of the lag phase of nitrification. The potential for mineralization of nitrogen was 30% of the organic nitrogen in the activated sludge and 38% of the organic nitrogen in the digested sludge. At 21 degrees, the mineralization rate constant was 0.026/day, corresponding to a 27-day half life. Moisture levels of 0.06 and 0.33 bars had no significant effect on the rate of nitrogen mineralization. Under unsaturated conditions, denitrification and nitrification could proceed either alternatively or simultaneously in the system. A model which assumed either zero or first order kinetics was devised to describe the nitrogen transformations of sludge-soil systems. The model was usually accurate in predicting the amount of ammonia, nitrate, nitrite, and organic nitrogen in the system and their rate of production. It was suggested that denitrification might be an important pathway of nitrogen transformation in sewage sludge-soil systems. (Geiger-FRC)
W81-02838

ATMOSPHERIC EMISSIONS OF ELEMENTS ON PARTICLES FROM THE PARKWAY SEWAGE-SLUDGE INCINERATOR,
Maryland Univ., College Park. Dept. of Chemistry.
R. R. Greenberg, W. H. Zoller, and G. E. Gordon.
Environmental Science and Technology, Vol 15, No 1, p 64-70, January, 1981. 1 Fig, 8 Tab, 26 Ref.

Descriptors: *Incineration, *Sludge disposal, *Ultimate disposal, Air pollution, Path of pollutants, Burning, Disposal, Waste water treatment, Metals, Heavy metals, Mercury, Lead, Pollutant identification, Public health, Parkway Waste Water Treatment Plant, Maryland.

Incineration of sewage sludge at the rate of 600 kg per hour at the Parkway Waste Water Treatment Plant, Laurel, Maryland, produced particulate emissions as follows (in grams per day): Hg 50, Pb 2, Na 8.2, Mg 4.8, Ca 6.5, Ba 7.3, Al 16, Ti 1.7, Cl 2, Fe 37, Zn 1.5. Other elements found in quantities less than 1 gram per day were Br, V, Cr, Mn, Co, Sc, Cu, Se, Ag, Cd, In, Sb, Ce, Eu, Yb, and Ta. The ash that escaped the scrubber system was less than 1% of the total 180 kg of ash produced from burning 600 kg sludge. The major point of the study was to determine if emissions from sewage sludge incinerators posed a threat to the community. Compared with emissions from coal-fired power plants, autos burning leaded gas, and municipal refuse incinerators, the emissions of Se, Sb, Hg, and Pb from sludge burning were minimal, and thus were considered no serious hazard to local residents. The most significant exposure was Hg at 50 g per day, for which airborne concentrations at ground level were slightly higher than ambient. (Cassar-FRC)
W81-02855

WASTEWATER EFFLUENTS FROM A TANNERY: THEIR EFFECTS ON SOIL AND VEGETATION IN PAKISTAN,
University of the Punjab., Lahore (Pakistan). Dept. of Botany.
For primary bibliographic entry see Field 3C.
W81-02897

5F. Water Treatment and Quality Alteration

FRANKLAW WATER TREATMENT WORKS.
Effluent and Water Treatment Journal, Vol 20, No 11, p 558-559, 561, November, 1980.

Descriptors: *Water treatment, *Water purification, Filters, Clarifiers, Sludge, Effluents, Water quality control, Water pollution treatment, Water pollution sources, Franklaw, United Kingdom.

The Franklaw Water Treatment Works operation is described. Raw water is taken from the River Wyre at the Garstang pumping station and transferred to the Franklaw treatment works via a 1400 mm steel main. The delivery main divides into three separate 800 mm mains at the works, each of which is equipped with a flow measuring Venturi and remote-operated flow control valves. The plant is designed to be under automatic control, being operated from a control room with a minimum of personnel involved. Strict water economy is enforced. The plant has been designed so that the flow can be adjusted to between 285 and 20 million liters per day and can be started up in half an hour to give drinkable water. The method of flocculation/clarification in the Degremont Superpulsator, a high speed clarifier, is described. The function of the Superpulsator is to allow the hydroxide flocs to separate from the water being treated. Clarification can simply be achieved by static tanks which operate on a batch principle. The flocculated water enters the tank and stands for a time long enough for the floc to settle out at the bottom of the tank as a sludge. The sludge blanket of a depth of approximately 3 m is controlled by sludge hoppers which are effectively troughs, the top edge of the trough being at the desired level of the blanket. There is a natural overflow of sludge into these troughs, where it is allowed to concentrate in order to reduce its volume prior to discharge. (Baker-FRC)
W81-02898

5G. Water Quality Control

GEOCHEMISTRY OF FLUORIDE IN THE BLACK CREEK AQUIFER SYSTEM OF HORRY AND GEORGETOWN COUNTIES, SOUTH CAROLINA--AND ITS PHYSIOLOGICAL IMPLICATIONS,
Geological Survey, Columbia, SC. Water Resources Div.
A. L. Zack.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, $2.50. Geological Survey Water-Supply Paper 2067, 1980. 40 p, 11 Fig, 1 Plate, 2 Tab, 24 Ref.

Descriptors: *Geochemistry, *Fluorides, *Groundwater, *Water quality, *South Carolina, Aquifer characteristics, Water wells, Chemical analysis, Mineralogy, Horry County(SC), Georgetown County(SC).

High concentrations of fluoride in groundwater supplies in certain areas of Horry and Georgetown Counties, S.C., have been the cause of dental fluorosis (tooth mottling) among persons who have lived in these areas and have ingested the water as children. Geochemical evidence and laboratory experiments demonstrate that fluorapatite in the form of fossil shark teeth is the source of fluoride, and that the fluoride ions are liberated to the groundwater system through anion exchange, rather than by dissolution. Calcite-cemented quartz sand in the upper third of the Black Creek Formation of Late Cretaceous age contains the fossil shark teeth. As groundwater progresses downdip, the calcite matrix dissolves and hydrolyzes, releasing bicarbonate, hydroxyl, and calcium ions. The calcium ions are immediately exchanged for sodium ions adsorbed on sodium-rich clays, and the bicarbonate ions accumulate. As the shark teeth are exposed, the hydroxyl ions in solution exchange with fluoride ions on fluorapatite surfaces. Experiments using fossil shark teeth show that sodium chloride in solution inhibits the rate of exchange of fluoride ions from tooth surfaces for hydroxyl ions in solution. The amount of fluoride removed from water and exchanged for hydroxyl ions in the presence of pure hydroxylapatite (hog teeth) was greater in saline water than in freshwater. (USGS)
W81-02677

WATER-RESOURCES INVESTIGATIONS, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
H. Klein.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $4.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File

Report 80-1207, 1980. 29 p, 15 Fig, 17 Ref.

Descriptors: *Water resources, *Investigations, *Groundwater availability, *Water quality, *Florida, Aquifer characteristics, Water levels, Water table, Saline water intrusion, Canals, Drainage, Data collections, Sites, *Collier County(FL), Southwest Florida, Floridan aquifer.

Early water-resources investigations in Collier County, Fla., were related to saltwater intrusion in Naples. With the advent of canal drainage and land reclamation farther inland, investigations were directed at effects of canals on water resources and the environment. High on the list of investigative needs are: (1) areal and vertical delineation of the shallow aquifer, the prime source of freshwater; (2) delineation of areas of poor quality ground water and the sources of the poor quality; (3) establishment of network of hydrologic data stations; and (4) determination of the relation between canals and the shallow aquifer. (USGS)
W81-02699

WATER QUALITY OF A RESERVOIR USED FOR RECLAIMED WATER STORAGE,
California Univ., Irvine. School of Engineering.
P. S. Dixon, and J. Scherfig.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-197618, Price codes: A04 in paper copy, A01 in microfiche. California Water Resources Center, University of California, Davis Technical Completion Report, April, 1980, 64 p, 3 Fig, 17 Tab. (California Water Resources Center Project UCAL-WRC-W-551). OWRT-A-070-CAL(1).

Descriptors: *Water quality, *Reclaimed water, *Reservoirs, Algal growth, Reservoir storage, Dissolved solids, Suspended solids, Chemicals, Reservoir operation, California.

The water quality of two reservoirs receiving differing amounts of reclaimed water is compared with a neighbouring reservoir receiving none. Monthly sampling of chemical parameters is presented, together with analyses of dissolved and suspended solids (the latter fractionated into sized components). Quantitative estimation of algal populations presented little significant information although measurement of algal growth potential, using the Selenastrum capricornutum 'bottle test', gave data of considerable importance for reservoir management. (Snyder-California)
W81-02712

AN APPROACH FOR ASSESSING THE WATER QUALITY SIGNIFICANCE OF CHEMICAL CONTAMINANTS IN URBAN LAKES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5C.
W81-02749

A WATER QUALITY PLANNING METHODOLOGY FOR URBAN AREAS,
CH2M/Hill, Reston, VA.
For primary bibliographic entry see Field 6B.
W81-02771

CHEMICAL TREATMENTS OF SOIL TO DECREASE RADIOSTRONTIUM LEACHABILITY,
Oak Ridge National Lab., TN. Environmental Science Div.
B. P. Spalding.
Journal of Environmental Quality, Vol 10, No 1, p 42-46, January-March, 1981. 3 Fig, 2 Tab, 12 Ref.

Descriptors: *Nuclear wastes, *Leaching, Path of pollutants, Groundwater pollution, Water quality control, Anions, Cations, Laboratory tests, Radioactive wastes, Water pollution, Radioactive waste disposal, Calcium carbonate, Water pollution control.

The shallow land burial of radioactive wastes often results in the leaching of radiostrontium into soils and groundwaters. A study was conducted by the Oak Ridge National Laboratory (ORNL) to investigate methods of arresting the leaching of 90Sr in situ. Three soils were collected from the solid waste disposal area at ORNL and were labeled with 85Sr and placed into small columns. The soil columns were percolated with equal amounts of sodium salt solutions of hydroxide, fluoride, carbonate, phosphate, silicate and aluminate before leaching with 0.1 N CaCl2. Only 30-35% of the 85Sr could be leached from two soils which were high in indigenous exchangeable calcium cations. The 85Sr was presumably precipitated along with the nascent CaCO3 produced during treatment. However, over 98% of the 85Sr was leached from all of the untreated soils. In general, less 85Sr was fixed by the other anions than by the carbonate treatment. These findings suggest that sodium carbonate may be a potential immobilizer of 90Sr in situ in soils contaminated by nuclear wastes. (Geiger-FRC)
W81-02826

THE POLITICS OF WATER POLLUTION CONTROL: A CASE STUDY OF THE FORMATION OF THE CANADA WATER ACT, PART I: COMPREHENSIVE WATER RESOURCE MANAGEMENT: PART II: NUTRIENT CONTROL,
King Alfred's Coll., Winchester (England).
For primary bibliographic entry see Field 6E.
W81-02836

FUNGAL PATHOGEN OF CLADOPHORA GLOMERATA (CHLOROPHYTA),
Academy of Natural Sciences of Philadelphia, Avondale, PA. Stroud Water Research Center.
T. L. Bott, and K. Rogenmuser.
Applied and Environmental Microbiology, Vol 40, No 5, p 977-980, November, 1980. 2 Fig, 28 Ref.

Descriptors: *Eutrophication, *Algal control, Laboratory tests, Aquatic fungi, Biocontrol, Pathogenic fungi, Lakes, Cladophora.

The pathogenic activity of Acremonium kiliense (Fungi Imperfecti) against Cladophora glomerata was investigated in laboratory tests and under more natural conditions. In the laboratory tests, fugal pathogenicity was demonstrated most clearly by cell condition and chlorophyll alpha concentration. More than 85% of the Cladophora cells were bleached at the highest inoculum level when conidia were added. In two microcosm experiments, after one week the C. glomerata in the inoculated flowing-water was almost completely chlorotic. In the controls, few cells were chlorotic. Further research with biological agents and algae capable of causing problem growths may yield new control procedures. During the course of these studies, the virulence of A. kiliense decreased. Thus variation in tolerance or adaptation of the target organism must be investigated. (Small-FRC)
W81-02846

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

USING CHANNEL GEOMETRY TO ESTIMATE FLOOD FLOWS AT UNGAGED SITES IN IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
W. A. Harenberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-153736, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-32, August 1980. 39 p, 6 Fig, 1 Plate, 3 Tab, 31 Ref.

Descriptors: *Channel morphology, *Estimating equations, *Flood flow, *Flood frequency, *Idaho, River basins, Analytical techniques, Flood forecasting, Flood discharge, Peak discharge, Flow characteristics, Basin characteristics, Channel geometry, Bankfull discharge, Bankfull width.

Measurements at bankfull stage were made at 136 sites in Idaho to determine whether predictions of flood discharge using channel-geometry characteristics are as good as or better than predictions using basin characteristics. These measurements are used to determine the variables of bankfull width, area, depth, and velocity. These variables are combined with basin characteristics for the sites, and multiple-regression techniques are used to select the best combination of variables to estimate the 10-year flood. To achieve the lowest standard error of estimate, the data set is divided into segments based on percentage of forest cover. Generally, discharge estimates obtained from equations using channel characteristics have smaller standard errors than those using basin characteristics. (USGS)
W81-02679

COMPUTER ROUTINES FOR PROBABILITY DISTRIBUTIONS, RANDOM NUMBERS, AND RELATED FUNCTIONS,
Geological Survey, Reston, VA. Water Resources Div.
W. Kirby.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $8.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-448, 1980. 61 p, 16 Ref.

Descriptors: *Computer programs, *Statistics, *Probability distribution, Data processing, Hydrologic data, Mathematical studies.

Use of previously codes and tested subroutines simplifies and speeds up program development and testing. This report presents routines that can be used to calculate various probability distributions and other functions of importance in statistical hydrology. The routines are designed as general-purpose Fortran subroutines and functions to be called from user-written main programs. The probability distributions provided include the beta, chi-square, gamma, Gaussian (normal), Pearson Type III (tables and approximation), and Weibull. Also provided are the distributions of the Grubbs-Beck outlier test, Kolmogorov's and Smirnov's D, Student's t, noncentral t (approximate), and Snedecor F tests. Other mathematical functions include the Bessel function I (subzero), gamma and log-gamma functions, error functions and exponential integral. Auxiliary services include sorting and printer plotting. Random number generators for uniform and normal numbers are provided and may be used with some of the above routines to generate numbers from other distributions. (USGS)
W81-02693

GROUNDWATER HYDROLOGY OF JAMES CITY COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02695

STUDY PLAN FOR THE REGIONAL AQUIFER-SYSTEM ANALYSIS OF ALLUVIAL BASINS IN SOUTH-CENTRAL ARIZONA AND ADJACENT STATES,
Geological Survey, Tucson, AZ. Water Resources Div.
T. W. Anderson.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $3.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1197, October, 1980. 22 p, 5 Fig, 27 Ref.

Descriptors: *Project planning, *Aquifer management, *Regional analysis, *Hydrogeology, Aquifer characteristics, Surface groundwater relationships, Groundwater availability, Drawdown, Groundwater movement, Water utilization, Water supply, Water quality, Model studies, Data collections, Water resources development, Water management(Applied), Arizona, California, Nevada, New Mexico, *Southwest U.S.

The U.S. Geological Survey has started a 4-year study of the alluvial basins in south-central Arizona and parts of California, Nevada, and New

Mexico to describe the hydrologic setting, available groundwater resources, and effects of historical development on the groundwater system. To aid in the study, mathematical models of selected basins will be developed for appraising local and regional flow systems. Major components necessary to accomplish the study objectives include the accumulation of existing data on groundwater quantity and quality, entering the data into a computer file, identification of data deficiencies, and development of a program to remedy the deficiencies by collection of additional data. The approach to the study will be to develop and calibrate models of selected basins for which sufficient data exist and to develop interpretation-transfer techniques whereby general predevelopment and postdevelopment conceptual models of the hydrologic system in other basins may be synthesized. The end result of the project will be a better definition of the hydrologic parameters and a better understanding of the workings of the hydrologic system. The models can be used to study the effects of management alternatives and water-resources development on the system. (USGS)
W81-02701

DEVELOPMENT OF A STREAMFLOW FORECASTING PROCEDURE FOR INTERMOUNTAIN BASINS,
Montana State Univ., Bozeman. Dept. of Civil Engineering.
A. B. Cunningham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198442. Completion Report, December, 1980. Montana Water Resources Research Center, Montana State University Report No 113. 26 p, 13 Fig, 7 Ref. OWRT A-116-MONT(1), 14-34-0001-9028.

Descriptors: *Streamflow forecasting, *Snowmelt, *Runoff forecasting, *Computer models, *Basins, Catchment areas, Forecasting, Streamflow, Flow, Overland flow, Thaw, Snowpack, Snow cover, Predictions, Computer programs, Model studies, Montana.

This research study sought to develop and test a method for forecasting the magnitude and profile of streamflow hydrographs occurring primarily as result of snowmelt runoff. Hence, the scope of the desired forecasting procedure was narrow by comparison with National Weather Service forecasting procedures. The study should be viewed as a contribution toward systematic water resources management in that it functions in supplying hydrologic data critical to operation of various types of surface water retention/regulation facilities. Properly calibrated, the developed procedure allows for forecasting daily streamflows over a 5-7 day forecast period in regions for which hydrologic data are limited. Basic data needed include: study-site daily streamflow values; mean daily temperatures; maximum snowpack water equivalent at onset of melt season. A developed computer-graphics-oriented algorithm was used to test the methodology, but the few calculations needed during routine forecasting can be handled without a computer, if desired. Three southwest Montana drainage basins were analyzed during the Spring 1980 runoff period. Favorable results were obtained concerning the adequacy of the streamflow forecasting procedure. (Zielinski-IPA)
W81-02726

CONTROL OF THE WATER RESOURCES OF THE AZOV SEA USING THE 'AZOV PROBLEM' FAMILY OF SIMULATION SYSTEMS,
Rostov-on-Don State Univ. (USSR). Inst. of Mechanics and Applied Mathematics.
A. B. Gorstko, F. A. Surkov, L. V. Epshteyn, and A. A. Matveyev.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, Aug 27-30, 79, Bloomfield Hills, MI. EPA Report 600/9-80-033, Jul 80. p 252-260, 2 Fig, 7 Ref.

Descriptors: *Water resources development, *Simulation, *Regional development, Water management, Water quality, Water conservation, Industrial water, Water use, Agriculture, Fisheries, Powerplants, Regional planning, Ecological effects, Information systems, Azov Sea basin, *Russia.

A well-developed industrial and agrarian complex has grown up in the Azov Sea drainage basin (USSR). Significant volumes of fresh water, which must be of high quality, are necessary for normal functioning and further development of industry, agriculture, power engineering, fishing, water transport, and normal living conditions. However, the region is poor in fresh water resources. The range of problems related to the use of water resources in the Azov Sea basin, conservation or conscientious reconstruction of the ecosystem of the Azov Sea, and the development of macroregional programs of supplementing the continental runoff in the basin is referred to as the Azov problem. Solution of the Azov problem requires systematic development of a multitude of versions of regional ecologic policies and water management strategies in the basin, and evaluation of the probable effects of these versions in combination with macroregional projects. The basic principle of organization of all scientific plans and plan development on the Azov problem should be the idea of the man-machine system. This should include structural subsystems, decision making personnel at various levels; experts on the Azov problem as a whole, and experts on its individual aspects; plan developers; 'Azov problem' simulation systems; and information bank; and persons who plan and conduct experiments with the simulation systems. (Moore-SRC)
W81-02743

ADEQUACY AND ECONOMICS OF WATER SUPPLY IN NORTHEASTERN ILLINOIS, 1985-2010,
Illinois State Water Survey, Urbana.
K. P. Singh, and J. R. Adams.
Illinois Institute of Natural Resources, Report of Investigation 97, 1980. 205 p, 47 Fig, 68 Tab, 39 Ref, 2 Append.

Descriptors: *Economics, *Aquifers, *Illinois, *Model studies, *Groundwater, Subsurface water, Radioactivity, Systems analysis, Value engineering, Water conveyance, Water costs, Water allocation(Policy), Water management(Applied), Water supply, Water treatment.

Plans were developed for optimal use of available groundwater and surface water resources for adequate and dependable water supply to all towns in Cook, DuPage, Kane, Lake, McHenry, and Will Counties. An efficient water-demand model, based on a town's population and industrial employment, was used for future demand projections. The potential yield of sand and gravel and Silurian dolomite aquifers was investigated. Cost functions were developed in terms of July 1980 dollars for wells, pumps, water conveyance system components, reservoirs, and treatment plants. Out of a total of 273 towns, 96 are presently served with lake water either directly or from Chicago. The groundwater supply from shallow aquifers is adequate for 85 towns. Thus, 92 towns need other sources of water if the safe yield of the deep sandstone aquifer is not to be exceeded. Six optimal regional systems to meet these demands were developed. The Fox Valley system considers conjunctive use of groundwater, as well as direct supply from Lake Michigan. The Kankakee River system considers water withdrawal from the river near Wilmington. The other four systems---Lake County, Northwestern Cook County, DuPage County, and Southern Cook County---obtain water from the lake directly or from Chicago. With the proposed individual groundwater and regional surface water systems, there is ample water for all towns in northeastern Illinois to meet their water demands for the next 30 or more years, without mining of the deep aquifer. (Author's abstract)
W81-02796

DEVELOPMENT OF A GROUNDWATER MODEL FOR THE HENRY'S FORK AND RIGBY FAN AREAS, UPPER SNAKE RIVER BASIN, IDAHO,
Idaho Univ., Moscow. Water and Energy Resources Research Inst.
J. Wytzes.
Research Technical Completion Report, Submitted to Idaho Department of Water Resources, August, 1980. 205 p, 24 Fig, 19 Tab, 115 Ref, 5 Append.

Descriptors: *Idaho, *River basins, *Water table fluctuations, *Groundwater basins, *Simulation analysis, Model studies, Streamflow, Permeability coefficient, Evapotranspiration, Storage coefficient, Geohydrologic units, Specific yield, Diversion losses, Snake River basin.

The study describes the essential aspects of a groundwater flow system in the subject area. It provides for a water resources planning and management tool in the form of a digital simulation model that can be used for efficient administration and management of local groundwater resources. A finite difference model, based upon the alternating direction technique, is used to simulate the basic mathematical equations governing groundwater flow in an isotropic, homogeneous water table aquifer. The model includes an iterative calibration procedure to adjust initial estimates of geohydrologic parameters, such as hydraulic conductivity, leakance factors, and storage coefficients in such a way that the deviations between simulated and measured 'historic' water levels are within a predetermined range. Historic water tables were measured during a selected calibration period from May 1977 through April 1978. Water budget components, such as irrigation diversions, stream flows, water conveyance system losses and climatological data were compiled in the input routine. The resulting model provides a reliable tool for research, planning and administrative purposes. (Garrison-Omniplan)
W81-02804

6B. Evaluation Process

SUMMARY OF HYDROLOGIC DATA FOR THE EAST EVERGLADES, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02697

A WATER QUALITY PLANNING METHODOLOGY FOR URBAN AREAS,
CH2M/Hill, Reston, VA.
F. W. Ellis, and R. L. Wycoff.
In: Urban Stormwater and Combined Sewer Overflow Impact on Receiving Water Bodies, Proceedings of the National Conference, Orlando, Florida, November 26-28, 1979, Environmental Protection Agency Report EPA 600/9-80-056, December 1980. p 590-617, 11 Fig, 7 Ref. 68-01-3993.

Descriptors: *Cost-benefit analysis, *Urban runoff, *Water quality management, *Cost analysis, Evaluation, Water quality control, Water pollution sources, Water pollution control, Hydrology, Sewer systems, Planning, Case studies, Philadelphia, Des Moines.

Because of the very large sums of money required to improve urban water quality, and the difficulty of raising money for such projects it is necessary that the projects demonstrate perceptible improvements in water quality, are required for the protection of the intended beneficial use of the receiving water, and make use of the most cost-effective pollution control methods. A two-phase approach has been developed to assess water quality problems and potential solutions. Phase I determines the beneficial uses of the receiving water; establishes water quality goals; determines the nature, sources, and extent of water quality problems; estimates the degree of pollution abatement required; determines the most cost-effective mix of control alternatives; and provides for evaluation of the project. If Phase I indicates that there are water quality problems that can be corrected with affordable solutions, the detailed analysis of Phase II is required. This phase considers the area's hydrol-

ogy, combined and separate sewer system hydraulics, nonpoint and point source pollutants, and the receiving water quality response. Case studies for Philadelphia, Pennsylvania, and Des Moines, Iowa, are used to illustrate the analyses and the site-specific nature of the water quality planning process. (Brambley-SRC)
W81-02771

SMALL SCALE HYDROPOWER DEVELOPMENT IN ILLINOIS: AN IMPLEMENTATION MANUAL,
WAPORA, Inc., Chicago, IL.
G. Lindsey.
Illinois Institute of Natural Resources Document No 80/30, December 1980. 180 p, 13 Fig, 7 Tab, 121 Ref, 3 Append.

Descriptors: *Illinois, *Hydroelectric plants, *Energy sources, *Environmental surveys, Feasibility studies, Licensing, Project benefits, Economic aspects, Hydraulic engineering, Dam effects, Dam construction, Permits, Reservoir siting.

Renewed interest in small-scale hydropower is growing rapidly as an alternative to the use of non-renewable fuels such as coal, uranium, oil, and gas. Preliminary studies in Illinois indicate that the development of a minimum of 57 to 130 megawatts of renewable, small-scale hydroelectric generating capacity is, or soon will be, economically feasible at existing dam sites. This implementation manual, written for readers with non-technical backgrounds, is intended to assist potential developers of existing dam sites, who may be newly acquainted with hydropower, in the implementation of small-scale hydropower projects. The manual is divided into nine sections: (1) a user's guide; (2) a conceptual description of a small-scale hydropower plant; (3) a summary of recent Federal and State programs designed to encourage small-scale hydropower development; (4) a review of the significance and potential of small-scale hydropower resources in Illinois; (5) techniques for making preliminary assessments of site potential; (6) regulatory considerations; (7) environmental considerations; (8) potential sources of financing; and (9) considerations for implementation. (Garrison-Ominplan)
W81-02788

PHASE I REPORT - INVENTORY OF POTENTIAL SMALL-SCALE HYDROPOWER SITES IN ILLINOIS AND SELECTION OF PROJECTS EXHIBITING POTENTIAL FOR DEVELOPMENT,
WAPORA, Inc., Chicago, IL.
G. Lindsey, G. M. Kelly, and D. Sweeney.
Illinois Institute of Natural Resources Document No 81/03, January, 1981. 29 p, 1 Fig, 5 Tab, 40 Ref, 2 Append.

Descriptors: *Illinois, *Hydroelectric power, *Hydroelectric plants, *Electric power production, *Feasibility studies, Power plants, Flow duration, Hydraulics, Damsites, Rivers, Water resources development, River basin development, Flow characteristics.

Interest in developing small-scale hydroelectric power has increased recently because of rapidly rising fossil and nuclear fuels costs, and constraints on sitings of new power plants. This report lists 114 potential small-scale sites, with existing dams, in Illinois. Fifteen sites exhibited the greatest economic potential for hydroelectric development. The combined generating capacity for the 57 sites for which head and flow data are available is estimated to be 176 MW; their mean capacity is 3.19 MW. Twenty-five sites have a potential capacity of more than 350 KW, while 21 sites have a potential capacity of less than 100 KW. Storage pools, which can be used to generate peak load power, exist at only 35 of the sites. Descriptions of seven hydropower feasibility or development projects now underway are included, as well as a narrative on the historical perspective of water power in Illinois. This report is the first of a three-part project entitled 'Low Head Hydroelectric Generation Potential in Illinois.' Phase II and Phase III report on the potential sites identified here, and describe procedures for implementation. (Garrison-Omniplan)
W81-02789

PHASE II REPORT - PRELIMINARY INVESTIGATION OF SMALL-SCALE HYDROPOWER POTENTIAL AT FIVE SITES IN ILLINOIS,
WAPORA, Inc., Chicago, IL.
G. Lindsey, and D. Sweeney.
Illinois Institute of Natural Resources Document No 81/05, January, 1981. 111 p, 33 Fig, 2 Tab, 50 Ref, 60 Append.

Descriptors: *Illinois, *Hydroelectric power, *Feasibility studies, Evaluation, Hydrologic data collections, *Economic aspects, Cost analysis, Hydroelectric plants, Electric power production, Flow duration, Hydraulics, Damsites, Rivers, Water resource development.

This is the second phase of a three-part study entitled 'Low-Head Hydroelectric Generation Potential in Illinois.' The report presents preliminary engineering, cost/benefit, and environmental analyses of the hydropower potential at five sites selected from the 114 sites identified in Phase I as having potential for hydropower production. The 114 original sites were screened to select those with the greatest relative potential for economic development. Sites with an estimated capacity of less than 350 kw were eliminated, as were sites with an average annual flow of less than 100 cubic feet/second. The engineering analyses on the five selected sites include descriptions of the existing structures and potential development alternatives at each site, along with conceptual design sketches. The five sites selected were the Oregon Dam on the Rock River in Oregon, the Upper-Sterling Dam on the Rock River at Sterling-Rock Falls, the Wilmington Dam on the Kankakee River at Wilmington, the Kankakee Dam on the Kankakee River at Kankakee, and the Elgin Dam on Fox River at Elgin. The break-even revenue requirement for each site is presented. Phase III will consist of a how-to manual to guide the implementation of additional hydropower plants in Illinois. (Garrison-Omniplan)
W81-02790

ASSESSMENT OF PUBLIC GROUNDWATER SUPPLIES IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W81-02794

ADEQUACY AND ECONOMICS OF WATER SUPPLY IN NORTHEASTERN ILLINOIS: PROPOSED GROUNDWATER AND REGIONAL SURFACE WATER SYSTEMS, 1985-2010,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W81-02795

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE LONG RUN PROFITABILITY OF WESTERN IRRIGATED AGRICULTURE: AN IN-DEPTH ANALYSIS,
Arizona Univ., Tucson. Coll. of Agriculture.
Y. Goldschmidt, and W. E. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193948, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, 1980. 57 p, 1 Fig, 13 Tab, 22 Ref. OWRT-B-080-ARIZ(5), 14-34-0001-0203.

Descriptors: *Economic evaluation, *Profit, *Irrigation practices, Income distribution, Agriculture, Farm management, Cost analysis, Economic aspects, Irrigation, Irrigable land, Income, Farming, Farms, Costs, Estimated costs, Accounting, Budgeting, Investment, Mathematical studies, Numerical analysis, Economic prediction, Economic yield.

The purpose of this study focused on the development of consistent conceptual procedures for analyzing profitability of irrigated farms during inflation, for developing cost budgets of such farms and for evaluating investment in water projects. Models of the organizations, costs, and returns of representative farms developed by agricultural economists for most western irrigated areas have generally shown little or no return to long-run capital investment (including irrigation development); yet it is observed that farmers do remain in business, make capital investments, and favor irrigation development. It was concluded that standard economic budgets do not give an accurate picture of reality. Three major variables are normally excluded from standard budgets: (1) long-run wealth development (versus short-run net income); (2) effects of income tax laws on short-run income and long-run wealth; and (3) the budget-distorting effects of inflation. Procedures for incorporating these three variables into budget analysis were developed and shown. The exclusion of each of these variables causes underestimation both of the income and wealth position of farmers. (Zielinski-IPA)
W81-02655

THE SEARCH FOR EQUITY AND EFFICIENCY IN THE PRICING OF A PUBLIC SERVICE: URBAN WATER,
Pennsylvania Univ., Philadelphia.
S. L. Feldman, J. Breese, and R. Obeiter.
Economic Geography, Vol 57, No 1, p 78-93, 1981. 2 Fig, 2 Tab, 23 Ref.

Descriptors: *Pricing, *Water rates, Marginal costs, Utilities, Unit costs, Economics, Costs, Water distribution(Applied), *Washington, D. C., Cost-benefit analysis, *Municipal water.

Practical ways of implementing the marginal cost pricing scheme are presented for urban water. Prices are based upon incremental costs for each rating period, the peak users bearing all capacity charges. As applied to the Washington Suburban Sanitary Commission, Washington, D. C., use of marginal cost pricing would produce an annual welfare gain of $1.85 million, justifying implementation of the plan requiring expensive demand meters. (Cassar-ERC)
W81-02831

6D. Water Demand

WATER-RESOURCES INVESTIGATIONS, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5G.
W81-02699

APPRAISAL OF GROUND-WATER RESOUCES IN THE SAN ANTONIO CREEK VALLEY, SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
C. B. Hutchinson.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $7.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-750 (WRI), August 1980. 48 p, 14 Fig, 5 Tab, 16 Ref.

Descriptors: *Groundwater resources, *Water yield, *Water utilization, *Water demand, *California, Overdraft, Hydrogeology, Aquifer characteristics, Water levels, Groundwater movement, Salinity, Water quality, Chemical analysis, Monitoring, Sites, Aerial photography, San Antonio Creek valley(CA), Santa Barbara County(CA), Barca Slough(CA).

A nearly threefold increase in demand for water in the 154-square-mile San Antonio Creek valley in California during the period 1958-77 has increased the potential for overdraft on the ground-water basin. The hydrologic budget for this period showed a perennial yield of about 9,800 acre-feet per year and an annual ground-water discharge of about 11,400 acre-feet per year, comprising net

pumpage of 7,100 acre-feet, phreatophyte evapotranspiration of 3,000 acre-feet, and base streamflow of 1,300 acre-feet. The base flow in San Antonio Creek could diminish to zero when net pumpage reaches 13,500 acre-feet per year. The environmentally sensitive marshland area of Barka Slough may then become stressed as water normally lost through evapotranspiration is captured by pumpage. The aquifer consists of alluvial valley fill that ranges in thickness from 0 to 3,500 feet. Ground water moves seaward from recharge areas along mountain fronts to a consolidated rock barrier about 5 miles east of the Pacific coast. Upwelling of ground water just east of the barrier has resulted in the 550-acre Barka Slough. Transmissivity of the aquifer ranges from 2,600 to 34,000 feet squared per day, with the lowest values occurring in the central part of the valley where the aquifer is thickest but probably finer grained. The salinity problems are increasing in the agricultural parts of the valley, which is east of the barrier. West of the barrier, stream and ground-water quality is poor, owing to seepage of saline water from the marine shale that underlies the area at shallow depths. A proposed basinwide monitoring program includes 17 water-level sites, 12 water-quality sampling sites, 3 streamflow measuring sites, and periodic infrared aerial photography of Barka Slough. A computer model of the ground-water flow system could be developed to assess the impact of various water-management alternatives. (USGS)
W81-02700

ADEQUACY AND ECONOMICS OF WATER SUPPLY IN NORTHEASTERN ILLINOIS, 1985-2010,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6A.
W81-02796

6E. Water Law and Institutions

PUBLIC ATTITUDES OF NEBRASKANS TOWARD WATER POLICY,
Nebraska Univ.-Lincoln, Dept. of Political Science.
S. Welch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198418. Price codes: A02 in paper copy, A01 in microfiche. Nebraska Water Resources Center, University of Nebraska Completion Report, March, 1981. 12 p, 7 Tab, 15 Ref. OWRT-A-058-NEB(1), 14-34-0001-9029.

Descriptors: *Nebraska, *Water policy, *Public opinion, *Policy making, Attitudes, Evaluation, Benefits, Political aspects, Administrative decisions, Public policy, Water law, Legal aspects, Social participation, Public participation, Political constraints, Water use, Water use efficiency, Water shortage, Administrative regulations, Regulations, Water deficit.

The project purposes were to ascertain the extent of public knowledge concerning Nebraska water policy and existing institutions dealing with Nebraska water policy (Natural Resource Districts (NRD'S)); to obtain detailed information on Nebraskan attitudes concerning suggested alternative groundwater policies; to identify groups of Nebraskans in favor of and opposed to several different types of water policy; and to communicate public setiments of this important issue to Nebraska State policy makers. The project used 1977-1980 collected data from the Nebraska Annual Social Indicators Survey (NASIS) by the Bureau of Sociological Research (at University of Nebraska-Lincoln). This is a Statewide survey of 1800 adult Nebraskans. It was concluded that: (1) Nebraskans support water usage control in water shortages, covering agriculture, business, industry, and household use; (2) government regulation, rather than higher prices or taxation, is favored for water usage control; and (3) most Nebraskans are unfamiliar with NRD's and have not participated in NRD elections. The project findings were forwarded to local and State water policy makers. (Zielinski-IPA)
W81-02725

CALIFORNIA'S WATER CONFLICT: NORTH VS SOUTH,
V. Kayfetz.
Ambio, Vol 9, No 6, p 319-320, 1980. 1 Fig.

Descriptors: *California, *Legislation, *Peripheral Canal, *Water rights, Water transfer, Proposition 8, Canals, Legal aspects, State Water Project, California Aqueduct, Deltas, Aqueducts, Environmental effects, Aquatic life, Water law, Water policy.

Opposition to the construction of the Peripheral Canal in the delta area 50 miles east of San Francisco is aimed at repealing the California Senate Bill 200, which authorizes a 20-year $5 billion expansion of the State Water Project, designed to move more northern water to the southern part of the state. Environmentalists are afraid that the 1000 sq mile delta will become unusable for wildlife and agriculture. Salinity problems may occur if insufficient water is allowed to flow to the Pacific. Supporters of the Canal say that water release into the eastern delta will prevent saline intrusion and restore aquatic life. Although Proposition 8 was designed to calm the northerner's fears, many suspect that the few remaining wild rivers may be tapped for consumption in the south. (Cassar-FRC)
W81-02809

THE POLITICS OF WATER POLLUTION CONTROL: A CASE STUDY OF THE FORMATION OF THE CANADA WATER ACT, PART I: COMPREHENSIVE WATER RESOURCE MANAGEMENT: PART II: NUTRIENT CONTROL,
King Alfred's Coll., Winchester (England).
J. W. Parlour.
Journal of Environmental Management, Vol 12, No 1, p 31-64, January, 1981. 1 Fig, 87 Ref.

Descriptors: *Water policy, *Canada Water Act, *Phosphates, Detergents, Nutrients, Legislation, Water law, Political aspects, Nitrilotriacetic acid, Legal aspects, Water resources, Governments, Social aspects, Water quality control, Regulations, Economics, Cost-benefit analysis, Environmental effects, Planning, Political constraints, *Water management, *Nutrient removal.

The 'inside' political aspects of the formation of the Canada Water Act are presented as a complement to earlier studies on the subject of sociopolitical responses to water pollution problems in Canada, 1945-1972. Part I of the paper concerns the formation of the Canada Water Act, Parts I and II, dealing with Comprehensive Water Resources Management and Water Quality Management, respectively. Part II of the paper concerns nutrient control, which is Part III of the Act. After years of preliminary development, during which policy changed from emphasis on water resources management alone to a concern for both water resources and water quality, the Canada Water Act was passed in 1970. Nutrient control was added later as a response to escalation of mass media attention and public concern. A step-by-step description of policies regulating phosphates in detergents is described, as well as the debate on a phosphate substitute, nitrilotriacetic acid, whose long-term health effects are not known. The author states that government scientists promoted policy which complied with their own research findings on eutrophication and phosphate/nitrilotriacetic acid research and suppressed information disagreeing with their views. Although the scientific information was an important factor in formulating policy, final regualtions were set with main concern for public and manufacturer acceptance. The government attempts to weigh costs and benefits of alternative ideas were unreliable and did not sufficiently consider social and economic factors. (Cassar-FRC)
W81-02836

6F. Nonstructural Alternatives

ESTIMATING FLOOD DAMAGES IN THE STATE OF GEORGIA,
Georgia Inst. of Tech., Atlanta. Coll. of Architecture.
T. N. Debo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198343, Price codes: A11 in paper copy, A01 in microfiche. Completion Report, January, 1981. Environmental Resources Center, Georgia Institute of Technology Report ERC 01-81. 213 p, 18 Fig, 17 Tab, 22 Ref, 3 Append. OWRT-A-081-GA(1).

Descriptors: *Flood damage, *Flood date, *Georgia, *Computer models, *Economic impact, Economic prediction, Drainage area, Damage, Floodproofing, Flood plain management, Floods, Floodwater, Flood frequency, Flooding, Model studies, Mathematical models, Model testing, Statistical models, Economic evaluation, Prediction.

This study sought to: document monetary Georgia flood damages; develop a computer model to estimate urban flood damages, for large/small areas throughout Georgia; develop urban flood estimation curves using the computer model, to estimate flood damages quickly for different flood plain developments; study flooding history in six selected case study urban areas and estimate existing and potential average annual expected area flood damages, using the estimation curves; and evaluate Georgia flood damage potential from the case studies and documented information. The economic computer model developed for the Columbus, Georgia, Storm Water Management Program was further refined for this study. Provided that sufficient data are available, the model can be used for estimating flood damages from any land use, using local stage-frequency data. There is very little reliable data documenting monetary damages related to different Georgia flood events; recommendations were developed to address this deficiency, which severely limits studies into flood damage aspects of storm water management. (Zielinski-IPA)
W81-02720

6G. Ecologic Impact Of Water Development

WATER QUALITY OF A RESERVOIR USED FOR RECLAIMED WATER STORAGE,
California Univ., Irvine. School of Engineering.
For primary bibliographic entry see Field 5G.
W81-02712

LONG-TERM CONSEQUENCES OF UPSTREAM IMPOUNDMENT,
G. E. Petts.
Environmental Conservation, Vol 7, No 4, p 325-332, Winter, 1980. 4 Fig, 31 Ref.

Descriptors: *Impoundments, *Dams, *Environmental effects, *Invertebrates, *Aquatic life, Upstream, Planning, Environmental effects, Channel morphology, Reservoirs, Erosion, Aquatic habitats, Fish, Construction, Flood control, Sedimentation, Deposition(Sediments), Rivers, Planning, Ecology.

The environmental consequences of dam and reservoir construction on a river system are considered in a framework consisting of first-, second-, and third-order impacts. The immediate and simultaneous effects of the activity (dam building) are first-order impacts, for example, reductions in peak flow, entrapment of sediment load, reduction in suspended sediment load, induced erosion immediately below the dam, and channel changes. These induce second-order impacts, changes in channels and invertebrate populations taking place over a longer period after construction--perhaps as long as 50 years. Channel cross-sectional reduction dominates morphological changes in impounded rivers--depth increase from erosion, depth decrease from sedimentation, width reduction from redistribution of the floodplain and channel boundary materials, and width reduction from sediment deposition. After initial changes in aquatic life during the second-order stage, further adjustments occur as part of a third-order impact. For example, accumulation of fine sediments in pools discourages growth of invertebrates and encourages establishment of rooted aquatic plants. These plants in turn can further affect channel morphology. Changes in

fish habitats, intimately associated with changes in channel width, depth, and sediment composition and in flora and fauna, may continue to occur for many years after the initial construction. Planners should not base environmental impact assessments on short-term effects alone, but must consider the complex interactions taking place over many years before a morphological and ecological equilibrium is reached. (Cassar-FRC)
W81-02835

POLAND LAUNCHES MAJOR PROGRAM TO RESTORE AND REGULATE COUNTRY'S LARGEST RIVER SYSTEM,
For primary bibliographic entry see Field 5D.
W81-02889

7. RESOURCES DATA

7A. Network Design

BASIC TRENDS IN THE STUDY OF HYDROCHEMICAL FIELDS AND THE STRUCTURE OF THEIR SPACE-TIME HETEROGENEITIES,
Gidrokhimicheskii Inst., Rostov-na-Donu (USSR).
V. L. Pavelko, B. M. Vladimirskiy, I. T. Gavrilov, and G. V. Tsytsarin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche.
In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, MI. EPA Report 600/9-80-033, July, 1980. p 1-8, 1 Fig, 11 Ref.

Descriptors: *Water quality, *Data acquisition, *Research priorities, Pollutants, Automation, Hydrology, Model studies, Model testing, *Water chemistry.

Currently the basic task of hydrochemical research is the development of prognostic and functional models of water quality, which must correspond to the requirement sof operational evaluation and quality control. To obtain the necessary data with the minimum of cost requires estimation of the space and time study level of each component given the existing parameters of the observation system; finding the mean level of study; finding the variation in the level of study with the space-time scanning step; and redistribution of the equipment of the observation network, in order to achieve a space-time level of study of each component agreeing with its weighted significance. The conduct of studies is the most important of the stages of model development, with the aim of using equipment efficiently to collect a large quantity of data. Automated measurements in situ can greatly increase the effectiveness of observation and measurement of pollutants. It is suggested that reference points be created for the performance of studies in priority regions, from which methodologic and technical guidance could be provided. (Brambley-SRC)
W81-02730

MODELING THE GREAT LAKES - A HISTORY OF ACHIEVEMENT,
Great Lakes Basin Commission, Ann Arbor, MI.
W. C. Sonzogni, and T. M. Heidtke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche.
In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, MI. EPA Report 600/9-80-033, July, 1980. p 9-36, 3 Tab, 98 Ref.

Descriptors: *Model studies, *Great Lakes, *Water quality, *Water circulation, Heated water, Poisons, Nonpoint pollution sources, Management planning, Eutrophication, Water quality, Phosphorus, Research priorities.

In an attempt to supplement and update other Great Lakes modeling reviews and to identify areas of relative strength and weakness in using current modeling technology to assist in the study of specific Great Lakes problems, over 100 models were identified in a literature survey. The models can be categorized into water quality; circulation/transport; heated effluent dispersion; toxic substances; nonpoint source; and other models. Most of the models are in the first two categories. The greatest constraint on the use of the models is the inherent difficulty associated with model verification. However, they are of great value in real planning situations, such as eutrophication in Lakes Erie and Ontario, policy and resource management decision making, and the formulation of desirable phosphorus loads or inputs into the lakes given different conditions of lake water quality. Future modeling efforts should be directed toward toxic chemicals, the nearshore area, and developing models which can be used practically to arrive at management decisions. (Brambley-SRC)
W81-02731

7B. Data Acquisition

OPTIMAL SAMPLING FOR LONG TERM TRENDS IN LAKE HURON,
Environmental Research Lab.-Duluth, Grosse Ile, MI. Large Lakes Research Station.
D. M. Dolan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche.
In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, MI. EPA Report 600/9-80-033, July, 1980, p 58-70. 2 Fig, 5 Tab, 21 Ref.

Descriptors: *Model studies, Water sampling, *Cost analysis, Tributaries, *Water pollution sources, Nutrients, Radioisotopes, Heavy metals, Suspended solids, Great Lakes, *Lake Huron.

The Lake Huron Surveillance Plan calls for intensive sampling of the main lake in 1980, 1989, and 1998, and sampling of the major tributaries each year, so that long term changes may be detected. There is a trade-off between accuracy and funds required so a method is required to optimize the sampling program to obtain the necessary accuracy at minimum cost. A dynamic mass balance model is to be used with the Kalman filter to provide estimates of lake concentrations. Three types of measurement can be made: sampling of the open lake; tributary and point source sampling; and all field and laboratory measurements that improve the accuracy of the mass balance model. For nutrients, the northern segment of the lake is oversampled, while the southern segment is undersampled. This situation can be improved by increasing the number of stations in the southern segment, or by improving the model to be used with the Kalman filter to obtain estimates of trends. These results are probably generalizable to other parameters that could be described well by a simple mass balance, such as conservative substances, radionuclides, some heavy metals, and suspended solids. Biological parameters and certain organic contaminants would require a more sophisticated approach. (Brambley-SRC)
W81-02733

AIRCRAFT REMOTE SENSING OF SOIL MOISTURE AND HYDROLOGIC PARAMETERS, CHICKASHA, OKLA., AND RIESEL, TEX., 1978 DATA REPORT,
Science and Education Administration, Beltsville, MD. Hydrology Lab.
For primary bibliographic entry see Field 2G.
W81-02782

SNOWPACK MONITORING IN NORTH AMERICA AND EURASIA USING PASSIVE MICROWAVE SATELLITE DATA,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
J. L. Foster, A. Rango, D. K. Hall, A. T. C. Chang, and L. J. Allison.
Remote Sensing of Environment, Vol 10, No 4, p 285-298, 1980. 11 Fig, 8 Ref.

Descriptors: *Satellites(Artificial), *Snow surveys, Monitoring, *Remote sensing, Microwaves, Data collection, Snowpacks, Snow cover, North America, Eurasia.

Passive microwave data from satellite monitoring was correlated with snow depth in four study areas--the Canadian high plains, Montana and North Dakota high plains, and the steppes of central Russia. Each area is relatively flat and homogeneous. Microwave brightness temperature correlated with snow depth within each area, but relationships could not be applied to another area because factors such as snow water equivalent, density, liquid water within the pack, grain and crystal sizes, ground cover, soil conditions, and surface temperatures affect the brightness temperature. Nimbus-6 (0.81 cm wave length) ESMR data produced higher correlations than Nimbus-5 (1.55 cm wave length) ESMR data. Qualitative monitoring of snow pack buildup and disappearance in a given area by this method appears feasible. (Cassar-FRC)
W81-02869

7C. Evaluation, Processing and Publication

SURFICIAL GEOLOGY OF NEW HAVEN QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
E. H. Muller, and T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1208 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *New Haven quadrangle(NY).

The location and extent of 13 kinds of surficial deposits in New Haven quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02661

SURFICIAL GEOLOGY OF ORWELL QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1116 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Orwell quadrangle(NY).

The location and extent of 11 kinds of surficial deposits in Orwell quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02662

SURFICIAL GEOLOGY OF PART OF LYSANDER QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
E. H. Muller, and T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1117 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New

York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Lysander quadrangle(NY).

The location and extent of seven kinds of surficial deposits in part of Lysander quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02663

SURFICIAL GEOLOGY OF REDFIELD QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
R. J. Jordan, and T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1118 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Redfield quadrangle(NY).

The location and extent of eight kinds of surficial deposits in Redfield quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02664

SURFICIAL GEOLOGY OF PART OF BOYLSTON CENTER QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1115 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Boylston Center quadrangle(NY).

The location and extent of seven kinds of surficial deposits in part of Boylston Center quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02665

SURFICIAL GEOLOGY OF PART OF SANDY CREEK QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1114 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Sandy Creek quadrangle(NY).

The location and extent of 11 kinds of surficial deposits in part of Sandy Creek quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02666

SURFICIAL GEOLOGY OF PART OF WORTH CENTER QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-967 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Worth Center quadrangle(NY).

The location and extent of six kinds of surficial deposits in part of Worth Center quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02667

SURFICIAL GEOLOGY OF OSWEGO WEST QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $1.75 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-968 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Oswego West quadrangle(NY).

The location and extent of 10 kinds of surficial deposits in Oswego West quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02668

SURFICIAL GEOLOGY OF OSWEGO EAST QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
E. H. Muller, and T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-1209 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Oswego East quadrangle(NY).

The location and extent of 11 kinds of surficial deposits in Oswego East quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02669

SURFICIAL GEOLOGY OF CENTRAL SQUARE QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
E. H. Muller, and T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-2039 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Central Square quadrangle(NY).

The location and extent of 10 kinds of surficial deposits in Central Square quadrangle, Oswego, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02670

SURFICIAL GEOLOGY OF MEXICO QUADRANGLE, OSWEGO COUNTY, NEW YORK,
Syracuse Univ., NY.
E. H. Muller, D. Andrews, and T. S. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.50 in paper copy, $0.50 in microfiche. Geological Survey Open-File Report 80-2040 (WRI), 1980. 1 Sheet.

Descriptors: *Geology, *Glacial aquifers, *Groundwater potential, Natural resources, *New York, Hydrogeology, Water wells, Water yield, Maps, *Oswego County(NY), *Mexico quadrangle(NY).

The location and extent of 10 kinds of surficial deposits in Mexico quadrangle, Oswego County, N.Y., are mapped on a 7.5-minute U.S. Geological Survey topographic map. The map was compiled to indicate the lithology and potential for groundwater development at any specific location. (USGS)
W81-02671

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1979--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, CA. Water Resources Div.
Geological Survey Water-Data Report CA-79-2, January 1981. 509 p, 3 Fig.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Pacific slope basins.

Volume 2 of water resources data for the 1979 water year for northeastern California consists of records of stage, discharge, and water quality of streams and wells; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 155 gaging stations, stage and contents for 20 lakes and reservoirs, water quality for 131 stations and 17 wells, and water levels for 85 observation wells. Also included are 8 crest-stage partial-record stations and 8 low-flow partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (USGS)
W81-02672

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1979--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
Geological Survey Water-Data Report CA-79-3, January 1981. 417 p, 12 Fig.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Great Basin, Walker River(CA), Truckee River(CA), Southern central valley basins(CA).

Volume 3 of water resources data for the 1979 water year for central California consists of records of stage, discharge, gage-height, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of wells. This report contains discharge records for 182 gaging stations, stage and contents for 40 lakes and reservoirs, gage-height records for 2 lakes, water quality for 55 stations, water levels for 44 observation wells, and water quality for 4 wells. Also included are 11 crest-stage partial-record stations and 4 water-quality partial-record stations. Additional water data were collected which are not part of the systematic data-collection program. It is published as a special investigation. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (USGS)
W81-02673

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1980--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-186033, Price codes: A17 in paper copy, A01 in microfiche. Geological Survey Water-Data Report LA-80-2, 1980. 371 p, 15 Fig.

Descriptors: *Hydrologic data, *Surface water, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Wells, Water level, Data collections, Sites, *Louisiana, *Southern Louisiana.

Water resources data for the 1980 water year for Louisiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, in three volumes, contains records for water discharge at 75 gaging stations (including stage for 71 of these stations); stage only for 38 gaging stations and 11 lakes; contents for 1 reservoir; water quality for 124 surface-water stations (including 34 gaging stations), 107 miscellaneous sites, 15 lakes, and 268 wells; and water levels for 506 observation wells. Also included are data for 271 crest-stage and flood-profile partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included in this report. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana. (USGS)
W81-02674

GROUND-WATER QUALITY AND DATA ON WELLS AND SPRINGS IN PENNSYLVANIA, VOLUME I--OHIO AND ST. LAWRENCE RIVER BASINS,
Geological Survey, Harrisburg, PA. Water Resources Div.
H. E. Koester, and D. R. Miller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $12.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1119, November 1980. 95 p, 15 Fig, 15 Tab, 2 Ref.

Descriptors: *Groundwater, *Water quality, Hydrologic data, Water wells, *Well data, *Pennsylvania, Springs, Aquifers, Water levels, Elevation, Water yield, Geohydrologic units, Sites, Chemical analysis, Trace elements, *Ohio River basin(PA), *St. Lawrence River basin.

Volume I of the Groundwater Quality and Data on Wells and Springs in Pennsylvania presents groundwater quality and physical data on about 1,200 well and spring sites in the Ohio and St. Lawrence River basins. Locations are shown on site-location maps derived from the hydrologic unit map. Codes showing the geologic age and aquifer are provided. (USGS)
W81-02675

STREAMFLOW STATISTICAL SUMMARIES FOR COLORADO STREAMS THROUGH SEPTEMBER 30, 1975, VOLUME 2: COLORADO RIVER BASIN ABOVE GUNNISON RIVER,
Geological Survey, Lakewood, CO. Water Resources Div.
H. E. Petsch, Jr.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $46.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 79-1060, 1980. 350 p, 3 Fig, 2 Tab, 15 Ref.

Descriptors: *Hydrologic data, *Streamflow, Streams, *Colorado, *Gaging stations, Surface waters, Flow duration, Discharge(Water), High flow, Low flow, Flow characteristics, Statistics, Annual, Monthly, Data collections, *Colorado River basin(CO).

Statistical summaries of daily streamflow data for 189 stations west of the Continental Divide in Colorado are presented in this report. Duration tables, high-flow sequence tables, and low-flow sequence tables provide information about daily mean discharge. The mean, variance, standard deviation, skewness, and coefficient of variation are provided for monthly and annual flows. Percentages of average flow are provided for monthly flows and first-order serial-correlation coefficients are provided for annual flows. The text explain the nature and derivation of the data and illustrates applications of the tabulated information by examples. The data may be used by agencies and individuals engaged in water studies. (USGS)
W81-02676

SELECTED CHEMICAL QUALITY CHARACTERISTICS IN STREAMS OF KENTUCKY, 1970-75.
Geological Survey, Louisville, KY. Water Resources Div.
For primary bibliographic entry see Field 2K.
W81-02680

MEASUREMENTS OF DISCHARGE, GAIN OR LOSS IN FLOW, AND CHEMICAL QUALITY OF THE POPLAR AND REDWATER RIVERS, NORTHEASTERN MONTANA, OCTOBER 24-25, 1979,
Geological Survey, Helena, MT. Water Resources Div.
K. A. Dodge, and G. W. Levings.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $2.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1210, November 1980. 16 p, 2 Fig, 3 Tab.

Descriptors: *Discharge measurement, Flow measurement, *Water quality, *Streams, *Montana, Flow rates, *Streamflow, Base flow, Specific conductivity, Water temperature, Surface-groundwater relationships, Data collections, Sampling, Sites, Chemical analysis, *Poplar River(MT), *Redwater River(MT).

Discharge, specific conductance, and water temperature were measured at 37 sites on the Poplar and Redwater Rivers in northeastern Montana on October 24-25, 1979, to provide data on the interaction between surface-water and groundwater systems. Streamflow gains or losses were computed for those stream reaches not sighificantly affected by irrigation. Water samples were collected at 17 of the sites for detailed chemical-quality analysis. The tabulated data provide an areally broad data base of concurrent base-flow conditions. (USGS)
W81-02682

HYDROLOGIC AND CLIMATOLOGIC DATA, SOUTHEASTERN UINTA BASIN, UTAH, AND COLORADO, WATER YEAR 1978,
Geological Survey, Salt Lake City, UT. Water Resources Div.
L. S. Conroy.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $21.25 in paper copy, $5.50 in microfiche. Geological Survey Open-File Report 80-1025, 1980. 166 p, 6 Fig, 8 Tab, 2 Ref.

Descriptors: *Hydrologic data, *Climatic data, *Colorado River basin, *Utah, *Colorado, Available water, Surface waters, Groundwater, Water quality, Precipitation(Atmospheric), Snow surveys, Streamflow, Flow rates, Water wells, Water yield, Water levels, Temperature, Specific conductivity, Water analysis, Chemical analysis, Southeastern Unita basin.

This report contains data collected in the vicinity of the oil-shale area in the southeastern Uinta Basin, Utah and Colorado, from Oct. 1, 1977, to Sept. 30, 1978. The data presented in tables, include monthly precipitation, depth-duration of rainfall, snow depth and water content, air temperature, daily streamflow records, water-quality data from continuous-recording gaging sites, water-quality data for wells and springs, and water levels, temperature, and specific conductance for selected wells. (USGS)
W81-02694

SUMMARY OF HYDROLOGIC DATA FOR THE EAST EVERGLADES, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. J. Schneider, and B. G. Waller.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $10.75, in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1292, 1980. 73 p, 56 Fig, 3 Tab, 4 Ref.

Descriptors: *Hydrologic data, *Swamps, *Rainfall, *Community development, *Florida, Water control, Discharge(Water), Water levels, Water table, Duration curves, Hydrographs, Water management(Applied), Everglades, *Dade County(FL).

The East Everglades area in south-central Dade County, Fla., occupies approximately 240 square miles. The area is flat and low lying with elevations ranging from sea level in the southeast part to 10 feet at Chekika Hammock with an average elevation of about 6 feet. Rainfall in the area averages 57.9 inches a year with about 80% of the total falling during the May to October wet season. There is some residential development and farming in the east-central part of the area where land elevations are slightly higher. Pressure by agricultural, commerical, and housing interests to develop the area is increasing. Historically, most of the area was flooded for extended periods of time. The construction of canals, levees, and controls has lowered the average water levels of the area. This has reduced the extent and decreased the time of flooding. Long-term hydrographs show graphically the effects that the water control works have had on the hydrologic system. The change in discharge into the north end of the East Everglades through the Tamiami Canal outlets, Levees 30 to 67A, due to construction is very pronounced. Maps showing the altitude of the water table for wet and dry periods indicate that Levee 67 Extended Canal greatly influences the water levels and shape of the water-table contours in the northwestern part of the East Everglades. (USGS)
W81-02697

WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1979.
Geological Survey, Carson City, NV. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-188740, Price codes: A17 in paper copy, A01 in microfiche. Geological Survey Water-Data Report NV-79-1, November, 1980. 388 p, 9 Fig.

Descriptors: *Hydrologic data, *Surface water, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical anal-

ysis, Lakes, Reservoirs, Wells, Water level, Data collections, Sites, *Nevada.

Water resources data for the 1979 water year for Nevada consist of records of discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 128 gaging stations; stage and contents for 20 lakes and reservoirs; water-quality data for continuing-record stations at 27 stream sites and 1 lake site and for partial-record stations at 71 stream sites, 3 lake sites, 8 wells, and 1 spring; and water levels for 208 observation wells. Also included are 78 crest-stage partial-record stations and 13 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Nevada. (USGS)
W81-02698

HYDROLOGIC MAPS AND DATA FOR SANTA FE COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
W. A. Mourant.
New Mexico State Engineer Basic Data Report, 1980. 180 p, 4 Fig, 3 Tab.

Descriptors: *Groundwater resources, *Hydrologic data, *Maps, *New Mexico, *Data collections, Water wells, Water levels, Contours, Springs, Sites, Specific conductivity, Chemical analysis, *Santa Fe County.

This report contains hydrologic and geologic data that will be useful in future quantitative studies of the water resources of Santa Fe County, N.Mex. It lists well and spring data, including well locations, water levels, and chemical analyses of well and spring water. Illustrations in the report include maps showing locations of wells and springs with water-level contours, and specific conductance of well and spring water. (USGS)
W81-02703

FIELD DATA DESCRIBING THE MOVEMENT AND STORAGE OF SEDIMENT IN THE EAST FORK RIVER, WYOMING. PART I. RIVER HYDRAULICS AND SEDIMENT TRANSPORT, 1979,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2J.
W81-02704

FIELD DATA DESCRIBING THE MOVEMENT AND STORAGE OF SEDIMENT IN THE EAST FORK RIVER, WYOMING. PART II. BED ELEVATIONS, 1979,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2J.
W81-02705

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1979--VOLUME 1. APALACHICOLA, CHOCTAWATCHEE, BLACKWATER, ESCAMBIA, PERDIDO, AND ALABAMA RIVER BASINS.
Geological Survey, University, AL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-179632, Price codes: A11 in paper copy, A01 in microfiche. Geological Survey Water-Data Report AL-79-1, October, 1980. 231 p, 7 Fig, 1 Tab.

Descriptors: *Alabama, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Appalachicola River basin, Choctawhatchee River basin, Blackwater River basin, Escambia River basin, Perdido River basin, Alabama River basin, Mobile River basin.

Water resources data for the 1979 water year for Alabama consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report, in two volumes, contains discharge records for 99 gaging stations, stage only for 23 gaging stations, stage and contents for 12 lakes and reservoirs, water quality for 71 gaging stations, and water levels for 53 observation wells. Also included are 24 low-flow partial-record stations, 20 crest-stage partial-record stations, 11 flood hydrograph partial-record stations, and 112 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alabama. (USGS)
W81-02706

WATER RESOURCES DATA FOR ALABAMA, WATER YEAR 1979--VOLUME 2. TOMBIGBEE, MOBILE, DOG, PASCAGOULA, AND TENNESSEE RIVER BASINS.
Geological Survey, University, AL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-179640, Price codes: A20 in paper copy, A01 in microfiche. Geological Survey Water-Data Report AL-79-2, October, 1980. 454 p, 7 Fig, 1 Tab.

Descriptors: *Alabama, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Dog River basin, Tombigbee River basin, Mobile River basin, Pascagoula River basin, Tennessee River basin.

Water resources data for the 1979 water year for Alabama consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report, in two volumes, contains discharge records for 99 gaging stations, stage only for 23 gaging stations, stage and contents for 12 lakes and reservoirs, water quality for 71 gaging stations, and water levels for 53 observation wells. Also included are 24 low-flow partial-record stations, 20 crest-stage partial-record stations, 11 flood hydrograph partial-record stations, and 112 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Alabama. (USGS)
W81-02707

DATA MANAGEMENT REQUIREMENTS FOR GREAT LAKES WATER QUALITY MODELING,
Environmental Research Lab.-Duluth, Grosse Ile, MI. Large Lakes Research Station.
W. L. Richardson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, MI. EPA Report 600/9-80-033, July, 1980, p 37-57. 8 Fig, 3 Tab, 13 Ref, 3 Append.

Descriptors: *Great Lakes, *Water quality, *Model studies, Data collections, *Data storage and retrieval, Data processing, Information systems, Information exchange, Water quality management, Lakes, Eutrophication, Costs.

Efficient data management is essential to water quality managment and research programs, requiring adequate staff and budget provisions for its implementation, regardless of the purpose to which the data are being applied. For the Great Lakes, water quality information is maintained in the STORET on-line data base system. It contains data collected by the U.S. participants in the Great Lakes Surveillance Plan, and all the open lake data collected by the Canadian Center for Inland Waters. The amount of information for the years prior to and including 1960, and 1961-1979 is given for each lake and the connecting channels, and a summary of Great Lakes eutrophication data is presented. Accurate and timely data processing plays a key role in the modeling process, subject to proper surveillance design. It is suggested that about 10% of total project costs be devoted to data management. (Brambley-SRC)
W81-02732

PRINCIPLE OF ORGANIZATION OF AN AUTOMATED INFORMATION SYSTEM,
Gidrokhimicheskii Inst., Rostov-na-Donu (USSR).
V. L. Pavelko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118374, Price codes: A18 in paper copy, A01 in microfiche. In: Proceedings of the Second American-Soviet Symposium on the Use of Mathematical Models to Optimize Water Quality Management, August 27-30, 1979, Bloomfield Hills, MI. EPA Report 600/9-80-033, July, 1980. p 197-206, 1 Fig, 2 Ref.

Descriptors: *Data collections, *Information systems, *Computers, *Water quality, *Ecological effects, Water pollution, Hydrologic data, Hydrobiology, Water chemistry, Monitoring, Data storage and retrieval.

A major problem of testing and control of the environment is the creation of an automated information system (AIS) for water quality as a section of a more general ecologic information system. The flow of information determines the external conditions of existence of the processes which we are studying. These, in turn, define the function of the source of a pollutant and are a response to the condition of water objects, and will be referred to as accompanying flows. These flows of information are related to hydrochemical subjects as follows: external conditions, such as hydrologic flow, meteorology, and hydrobiologic data; source function, such as data on waste waters, pollution of the atmosphere and soil, hydrogeologic data, sedimentation, burial of pollutants, and hydrobiologic characteristics; and response, such as sanitary-hygienic data, hydrobiologic data, ichthyologic data, industrial water use, and marine hydrochemistry. The principles which were used in the creation of the AIS-hydrochemistry system are summarized. Included are some of the results obtained, which are recommended as principles for the creation of a global monitoring AIS, which is expected will ultimately include all nations. (Moore-SRC)
W81-02740

8. ENGINEERING WORKS

8A. Structures

SAFETY EVALUATION OF EXISTING DAMS, A MANUAL FOR THE SAFETY EVALUATION OF EMBANKMENT AND CONCRETE DAMS.
Water and Power Resources Service, Denver, CO. Water Resources Technical Publication, 1980. 164 p, 2 Fig, 33 Ref, 3 Append.

Descriptors: Concrete dams, Earth dams, Rockfill dams, *Dams, *Safety, *Inspection, Embankments, Hydraulic structures, Dam failure, Dam design, Dam stability, On-site investigations, Dam construction, *Dam stability, Evaluation.

The purpose of the SEED (Safety Evaluation of Existing Dams) Program is to comprehensively review the design, construction, and performance history of all Water and Power Resources Service dams, to evaluate their structural and hydraulic integrity, and to determine any need for remedial actions. This manual is intended to provide engineering and technical personnel at all levels of

government (Federal, State, and local) and private engineering organizations with sound, comprehensive guidelines and procedures for the inspection and evaluation of public and private dams. The manual sets forth guidelines for: scope and frequency of evaluations; team selection and responsibilities; preparing and updating Data Books; evaluating design, construction, and operations; making field examinations; developing conclusions and recommendations; and preparing reports. The design of the dam and appurtenant structures should be reviewed to assess the actual performance compared to the intended performance. Engineering data and records originating during the construction period should be reviewed to determine if the structures were constructed as designed. A field examination and review of available instrumentation records also should be made to assess the actual performance of the structures. Sample field examination checklists are provided for both embankment dams and concrete dams. (Moore-SRC)
W81-02774

8C. Hydraulic Machinery

ALGORITHMS FOR PIPE NETWORK ANALYSIS AND THEIR RELIABILITY,
Kentucky Water Resources Research Inst., Lexington.
D. J. Wood.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-193971, Price codes: A05 in paper copy, A01 in microfiche. Research Report No 127, March 1981. 108 p, 6 Fig, 21 Tab, 19 Ref. OWRT-B-060-KY(1), 14-34-0001-9114.

Descriptors: *Water distribution, *Pipe flow, Pipelines, Networks, *Steady flow, Pumps, Pipe network, *Algorithms, Convergence, Pipe network analysis.

Algorithms for analyzing steady state flow conditions in pipe networks are developed for general applications. The algorithms are based on both equations expressed in terms of unknown flowrates and node equations expressed in terms of unknown grades. Five methods, which represent those in significant use today, are presented. An example pipe network is analyzed to illustrate the application of the various algorithms. The various assumptions required for the different methods are presented and the methods are compared within a common framework. The reliabilities of these commonly employed algorithms for pipe network analysis are investigated by analyzing a large number of pipe networks using each of the algorithms. Numerous convergence and reliability problems are documented. It is shown that two methods based on loop equations have superior convergence characteristics. Methods based on node equations are less reliable and these methods are often unable to adequately handle low resistance lines. A discussion of convergence criteria and solution reliability is presented for the various algorithms. The results presented in this report will allow engineers to accurately carry out pipe network analysis.
W81-02658

APPLICATION OF WIND ENERGY TO GREAT PLAINS IRRIGATION PUMPING,
Science and Education Administration, Manhattan, KS. North Central Region.
L. J. Hagen, L. Lyles, and E. L. Skidmore.
Advances in Agricultural Technology AAT-NC-4, January 1980. 24 p, 23 Fig, 7 Tab, 27 Ref.

Descriptors: *Pumping, *Irrigation efficiency, *Wind energy, *Irrigation wells, Wind velocity, Sprinkler irrigation, Computer programs, Irrigation requirements, Economic efficiency, Well yield, Fuel, Nebraska, Kansas, Texas, Wheat, Corn, Case studies.

A computer program was developed to simulate operation of wind-powered irrigation wells. Pumping by wind turbine systems was simulated for two variable and two constant flow operational modes in which auxiliary motors were used in three of the modes. A comparison was made among the four modes of well yields and maximum pumping rates as a function of drawdown in a typical well. The program also was used to determine monthly well yields using a 250 sq m swept area wind turbine system in each mode if located at Columbus, Nebraska, Garden City, Kansas and Amarillo, Texas. The percentage of fossil fuel replaceable by wind energy was calculated for the most efficient constant and variable flow modes. Wind powered systems could supply half or more of the Great Plains irrigation energy demand using the present mix of sprinkler and surface distribution systems. Proper irrigation management is important to maximize wind energy use. Fully irrigated summer crops with preplant irrigation will use 30 to 60% of the annual, capturable wind energy, depending on crop and location. Fully irrigated equal areas of corn and winter wheat will use 70 to 85% of the wind energy, depending on location. With limited irrigation, 50 to 100% of the wind energy can be used, depending on practices followed. (Moore-SRC)
W81-02781

8I. Fisheries Engineering

A SOLAR HEATED FISH HATCHERY WATER RECYCLING SYSTEM,
Sea Run, Inc., Kennebunkport, ME.
E. S. Sawyer, and P. J. Sawyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-196750, Price codes: A03 in paper copy, A01 in microfiche. Office of Water Research and Technology Report OWRT-RU-81/3, July, 1980. 31 p, 9 Fig, 5 Tab, 12 Ref. OWRT-C-80165-R(No 8811)(1), 14-34-0001-8811.

Descriptors: *Water reuse, *Aquaculture, *Fish hatcheries, *Solar radiation, Biological filters, Chemical treatment, Smolt, Trout, Water consumption, Growth.

The purpose of this project was to rear smolts, young salmonids large enough for seawater entry, in a water recycling hatchery. High reuse was necessary to overcome temperature and groundwater limitations in coastal Maine and New Hampshire. Four rearing units were operated in a partially underground building. Each unit consisted of a 2,000 gallon fish tank and 500 gallon flooded biological filter, and reared 20,000 to 25,000 rainbow trout to smolt size (4 inches). Water consumption averaged 10 gallon/day/unit compared to 57,000 gallon/day/unit in a flow-through hatchery. Solar heating of water to accelerate fish growth resulted in shortening production time for a 4 inch fish from 18 months to 6 months. Costs/unit were approximately the same as those of a flow-through hatchery that must pump water, and considerably less than a flow-through hatchery that must heat water.
W81-02709

THE WRRI TROUT COVER RATING METHOD: DEVELOPMENT AND APPLICATION,
Wyoming Univ., Laramie. Water Resources Research Inst.
T. A. Wesche.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198368, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Series No 78, December, 1980. 46 p, 9 Fig, 5 Tab, 9 Ref, Append. OWRT B-032-WYO(2), 14-34-0001-6135.

Descriptors: Brown trout, Brook trout, Colorado River cutthroat trout, *Trout, Water depth, Flow rates, Streams, Surveys, *Instream flow, *Trout habitat, *Trout cover, Environmental effects.

Trout cover can generally be described as object-oriented, having a water depth of at least 0.5 feet, a point water velocity of less than 0.5 feet per second, and a mean water velocity of less than 1.0 feet per second. Brown trout were found to be more cover-oriented than are brook or Colorado River cutthroat trout. A significant positive relationship was found to exist between the amount of cover available and the standing crops of brown trout. For measuring available cover in smaller streams (average discharge less than 100 cfs), the basic WRRI Cover Rating (WCR) Method is recommended. For larger streams, the modified WCR Method (including a 'deep-water' factor) is best suited. Step-by-step instructions for the use of both methods are presented in the Appendix.
W81-02717

TEMPERATURE-CONTROLLED RECIRCULATING SYSTEM FOR HATCHING CATOSTOMID LARVAE,
Purdue Univ., Lafayette, IN. Dept. of Forestry and Natural Resources.
K. D. Curry, and A. Spacie.
The Progressive Fish-Culturist, Vol 42, No 3, p 151-152, July, 1980. 1 Fig, 4 Ref. OWRT A-052-IND(3).

Descriptors: *Temperature control, *Fish hatcheries, Fish eggs, Suckers, Catostomid, Larvae, *Fish hatching system.

A brief note describes a temperature-controlled recirculating fish hatching system. The principal parts of the unit are refrigeration unit, submersible pumps, the aquaria and floating egg cups. The system enables tempeature control between 2 and 21C. Water temperature can easily be adjusted to match stream temperatures prevailing where fish eggs are collected and fertilized.
W81-02728

AQUACULTURE: CATFISH AND TROUT, INVENTORY AND SALES, 1980.
Economics and Statistics Service, Washington, DC. Crop Reporting Board.
Statistical Bulletin 644, October 1980. 12 p, 15 Tab.

Descriptors: *Fish farming, *Trout, *Surveys, *Catfish farming, Fish harvest, Water use, *Aquaculture, Water supply, Water requirements, Economic evaluation.

Selected state estimates of catfish and trout inventories as of August 1, 1980, and sales from January 1 through July 31 were prepared from a survey conducted in late August. A probability sample of about 1,330 was selected from a list of all known commercial producers and an area frame sample was used to estimate for producers not on the list. Catfish were produced in 10 states, in which 43.4 million pounds were sold with a value of $33.8 million. Producers were using 56,200 acres of water surface and reported intentions to expand operations by 16,100 acres during 1981. The primary source of water supply was from wells followed by rain and/or watershed. Trout growers in 9 selected states sold 28.5 million pounds of trout valued at $24.6 million. Producers planned to extend the current utilization of 63.0 million cubic feet by 4.16 million cubic feet in 1981. The primary water source was springs followed by wells. (Brambley-SRC)
W81-02776

AQUACULTURE: OPPORTUNITIES FOR AN EXPANDED INDUSTRY IN ILLINOIS,
Illinois Natural History Survey, Urbana.
R. W. Gordon, and R. E. Westgren.
Illinois Institute of Natural Resources, Chicago. Document No 80/18, December, 1980. 118 p, 4 Fig, 28 Tab, 56 Ref, 3 Append.

Descriptors: *Illinois, *Aquaculture, *Catfish ponds, *Fish farming, *Commercial fishing, Fish ponds, Catfish, Carp, Trout, Eel, Frogs, Plankton, Algae harvesting, Animal diseases, Strip mine lakes.

Aquaculture---growing aquatic organisms in freshwater systems---appears practical, feasible, and potentially profitable in Illinois. For example, results of recent studies suggest that good aquaculture businessmen who raise catfish that retail for $2.80/pound may expect annual profits ranging from $625 to $1,250 per hectare. Small operations are less likely to be profitable than larger systems, due

to various fixed costs; catfish ponds of 20-acre size with multiple ponds are recommended. In addition to pond culture, aquaculture systems in raceways, silos, and cages are discussed, and economic estimates are given for trout and perch as well as for catfish. In Illinois, fewer than 200 acres of water are currently used for the culture of commercial catfish. In contrast, Arkansas and Mississippi have more than 25,000 acres of ponds in use for catfish production. Several economic obstacles affect the growth of Illinois's aquaculture industry, such as land costs, taxes, interest costs, and alternative uses for farmland. Other obstacles are lack of knowledge, insufficient marketing and service support for entrepreneurs, and a current lack of support from bankers and agricultural supply firms. The report suggests using other states as models to overcome these obstacles, with the goal of developing an industry that is a viable branch of agriculture in Illinois. (Garrison-Omniplan)
W81-02797

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

COWEETA HYDROLOGIC LABORATORY, 1934-2034: PAST, PRESENT AND FUTURE,
Southeastern Forest Experiment Station, Franklin, NC. Coweeta Hydrologic Lab.
J. E. Douglass, and D. G. Neary.
In: Proceedings of the Helsinki Symposium, June, 1980. IAHS-AISH Publication No 130, p 61-65. 6 Ref.

Descriptors: *Coweeta Hydrologic Laboratory, North Carolina, *Appalachian Mountain Region, *Forestry, *Hydrology, *Research facilities, Research priorities, Rainfall, Runoff, Water resources, Water yield, Water quality, Models, Water pollution sources, Forest managment, Ecosystems.

The early research at Coweeta Hydrologic Laboratory, North Carolina, emphasized calibration of basins and establishment of rainfall-runoff patterns. Subsequently land use, forest cutting and species conversion were studied to determine their effects on water resources primarily, water yield. Integration of the results of soil, plant, atmospheric and hydrologic studies led to the development of process models for the simulation of streamflow. Current studies emphasize water quality rather than water quantity, focusing on mineral cycling and nonpoint source pollution. Mineral cycling is investigated to understand and assess the consequences of specific forest management practices on terrestrial and aquatic ecosystems and to determine the effects of alternative levels of timber utilization on future productivity of the system. Future projects will continue the trend toward short-term studies relating alternative management practices to water quality. Coweeta will continue to be used for studying basic hydrological processes, for testing improved models and for paired basin studies of hydrological and ecological problems. (Brambley-SRC)
W81-02729

USGS: ITS WATER RESOURCES RESEARCH ACTIVITY,
S. Miller.
Environmental Science and Technology, Vol 15, No 2, p 140-142, February, 1981.

Descriptors: *Research, *Water resources, *United States Geological Survey, *Research facilities, Projects, Hydrology, Model studies, Water pollution, Waste disposal.

The Water Resources Division of the U.S. Geological Survey has 2900 employees, 373 of whom are engaged in research. There are 46 district offices through which the federal-state cooperative programs are implemented. Each of the four regional research centers studies a wide range of hydrologic problems and specializes in certain disciplines. The Gulf Coast Hydroscience Center's area of expertise is mathematical modeling for transfer and fate of organic pollutants in water resources. The Reston, Va., office concentrates on geochemical and groundwater research. The Denver center focuses on sediment research, groundwater transfer, and the fate of pollutants. Biology and geothermal studies are specialties of the Menlo Park, Cal., office. Proposed research programs involve droughts, tidal freshwater streams, lakes, water use data applications, and hydrologic factors associated with volcanic activity. Continuing attention will be given to hazardous waste disposal, acid rain, groundwater contamination, and cold region hydrology. (Cassar-FRC)
W81-02839

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WATER RESOURCES THESAURUS, THIRD EDITION.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-198376, Price codes: A07 in paper copy, A01 in microfiche. Publication OWRT IT-80/1, 1980. 132 p.

Descriptors: *Thesauri, *Information systems, *Indexing, *Information retrieval, *Water resources, Vocabularies, Computers, Abstracting, On-line retrieval, On-line searching, Libraries, Publications, Research, Technology transfer, Technology.

The third edition of the Water Resources Thesaurus, which represents a major revision of the previous 1971 edition, provides a vocabulary for indexing and retrieving the literature of water resources research and development. The terms in this edition were selected from the more than 105,000 indexing terms used in the 'Selected Water Resources Abstracts'. Some high frequency terms were excluded because they were too broad or ambiguous. Also deleted were the names of specific legislative acts, rivers, oceans, bays, birds, and most chemical terms. Due to changes in retrieval capability, such as text searching, this edition emphasizes terms useful for classifying or grouping specifics because such terms are needed in selecting subsets, but may not appear in the abstract. The Thesaurus has three sections: Thesaurus of Descriptors, Descriptor Words, and Descriptor List. The Thesaurus of Descriptors, the main indexing and retrieval tool, is an alphabetical list of terms interfiled with five types of cross-references: USE, Used For, Broader Term, Narrower Term, and Related Term. Descriptor Words is an alphabetical listing of each significant word comprising a term in the Thesaurus. The Descriptor section contains all approved terms, allowing for quick verification of terms and their spelling. (Seigler-IPA)
W81-02718

10D. Specialized Information Center Services

DIRECTORY OF ASSISTANCE CENTERS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225, Price: $3.50 in paper copy, $1.75 in microfiche. Geological Survey Open-File Report 80-1193, (supersedes Open-File Report 79-423). 1980. 10 p.

Descriptors: *Data storage and retrieval, *Information exchange, *Indexing, *Cooperatives, Assistance centers, Directory, U.S. Geological Survey, Water Resources Division, *National Water Data Exchange(NAWDEX).

The National Water Data Exchange (NAWDEX), managed by the U.S. Geological Survey, has established a network of Assistance Centers throughout th United States and Puerto Rico to assist users of water data in identifying and locating the data they need. This Directory provides the information needed to contact any of the established Centers. (USGS)
W81-02681

SUBJECT INDEX

ABSORPTION
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

ACID MINE WATER
Sediment Characteristics of Eleocharis Acicularis (L.) R. S. Sites in Streams and Lakes of Central Pennsylvania,
W81-02821 5C

ACID RAIN
Mechanisms by Which Acid Precipitation Produces Embryonic Death in Aquatic Vertebrates,
W81-02716 5C

Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

ACIDIC WATER
Growth Responses of Yellow Perch, Perca Flavescens (Mitchill), to Lake Acidification in the La Cloche Mountain Lakes of Ontario,
W81-02833 5C

Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

ACIDS
Chromatographic Enrichment of Acidic Compounds From Organic Solvents Using Alkali Metal Silicates,
W81-02829 5A

ADVANCED WASTE WATER TREATMENT
Hoover Dam Advanced Waste Treatment System; Volume I, Pilot Studies Report.
W81-02772 5D

Hoover Dam Advanced Waste Treatment System: Volume II, Pilot Studies Summary Data.
W81-02773 5D

AERATION
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

Reconstruction of Maldon STW,
W81-02899 5D

AERIAL PHOTOGRAPHY
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

AGRICULTURAL RUNOFF
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

AGRICULTURE
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa,
W81-02861 5D

Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

AIR TEMPERATURE
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

ALABAMA
Water Resources Data for Alabama, Water Year 1979--Volume 1. Apalachicola, Choctawatchee, Blackwater, Escambia, Perdido, and Alabama River Basins.
W81-02706 7C

Water Resources Data for Alabama, Water Year 1979--Volume 2. Tombigbee, Mobile, Dog, Pascagoula, and Tennessee River Basins.
W81-02707 7C

ALASKA
Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

ALGAE
Detection of Lipid Degradation Products in the Water of a Reservoir During a Bloom of Synura Uvella,
W81-02850 5A

Coal-Liquefaction Products, Shale Oil, and Petroleum. Acute Toxicity to Freshwater Algae,
W81-02854 5C

The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa,
W81-02861 5D

Algal Response to Copper Under Riverine Conditions,
W81-02862 5C

Some Ecological Observations on Environmental Parameters, Planktonic Seasonal Succession and Biomass in Rio Cruces (Prov. Valdivia), South Chile,
W81-02876 5C

ALGAL CONTROL
Fungal Pathogen of Cladophora Glomerata (Chlorophyta),
W81-02846 5G

ALGORITHMS
Algorithms for Pipe Network Analysis and Their Reliability,
W81-02658 8C

ALUM
The Effect of pH on the Coagulation and Purification of Wastewater,
W81-02832 5D

AMMONIA
An Ion-Exchange Technique for Concentrating Ammonia From Small Volumes of Seawater,
W81-02823 5A

AMOCO CADIZ
Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

AMPHIBIANS
Mechanisms by Which Acid Precipitation Produces Embryonic Death in Aquatic Vertebrates,
W81-02716 5C

ANALYTICAL TECHNIQUES
An Ion-Exchange Technique for Concentrating Ammonia From Small Volumes of Seawater,
W81-02823 5A

ANCHORAGE
Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

APPALACHIAN MOUNTAIN REGION
Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future,
W81-02729 9C

AQUACULTURE
A Solar Heated Fish Hatchery Water Recycling System,
W81-02709 8I

Aquaculture: Catfish and Trout, Inventory and Sales, 1980.
W81-02776 8I

Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

AQUATIC ANIMALS
Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

AQUATIC DRIFT
Behavioral and Catastrophic Drift of Invertebrates in Two Streams in Northeastern Wyoming,
W81-02702 2E

AQUATIC ENVIRONMENT
A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

AQUATIC FUNGI
Vegetative Propagation of Some Saprolegniaceae Under Simulated-Estuarine-Culture Conditions,
W81-02814 2L

AQUATIC LIFE
Effects of Fly Ash Heavy Metals on Daphnia Magna,
W81-02715 5B

Long-Term Consequences of Upstream Impoundment,
W81-02835 6G

AQUATIC PLANTS
Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

AQUATIC WEED CONTROL
Proceedings of the Workshop on Aquatic Weeds: Control and its Environmental Consequences, Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida, February 25-26, 1980.
W81-02787 4A

AQUIFER CHARACTERISTICS
Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

AQUIFER MANAGEMENT
Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

Study Plan for the Regional Aquifer-System Analysis of Alluvial Basins in South-Central Arizona and Adjacent States,
W81-02701 6A

AQUIFER TESTING
Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

AQUIFERS
Selected Water-Level Records for Oklahoma, 1979-80,
W81-02683 2F

Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

ARTIFICIAL RECHARGE
Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

ATOMIC ABSORPTION SPECTROPHOTOMETRY
Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation,
W81-02811 5A

BACTERIA
Scanning Electron Microscope Evidence for Bacterial Colonization of a Drinking-Water Distribution System,
W81-02812 5A

Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

Utilization of Low Concentrations of Starch by a Flavobacterium Species Isolated From Tap Water,
W81-02851 5A

Simple Method for Concentration of Bacteria From Large Volumes of Tap Water,
W81-02853 5A

Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

BACTERIAL ANALYSIS
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies,
W81-02848 5A

BACTERIOPHAGE
Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

BANK EROSION
Bank Erosion of the Illinois River,
W81-02791 2J

BASELINE STUDIES
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

BASINS
Development of a Streamflow Forecasting Procedure for Intermountain Basins,
W81-02726 6A

BASS
Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

BATHYMETRY
A Multi-Layered Nested Grid Model of Lake Superior,
W81-02741 2H

BAYES-MARKOV ANALYSIS
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

BED LOAD
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

BENTHIC FAUNA
Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

BENTHOS
The Macrobenthos of Lakes Rotoroa and Rotoiti, South Island, New Zeland, With Special Reference to the Influence of Allochthonous Organic Detritus,
W81-02880 2H

Temporal Patterns in Recolonization of Stream Benthos,
W81-02883 5C

BIOCONTROL
Proceedings of the Workshop on Aquatic Weeds: Control and its Environmental Consequences, Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida, February 25-26, 1980.
W81-02787 4A

BIODEGRADATION
Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,
W81-02868 5B

Biodegradation of Chemicals of Environmental Concern,
W81-02871 5B

BIOINDICATORS
Measurement of Physiological Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

Organochlorine Compounds in Mussels From Scottish Coastal Waters,
W81-02858 5A

Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments,
W81-02887 5C

Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

BIOLOGICAL COMMUNITIES
Affinity Tests for the Detection of Community Alteration in Plankton: Evaluation With a Distributional Computer Model,
W81-02860 5C

BIOLOGICAL WASTE WATER TREATMENT
The Effect of Heavy Metals on the Performance of Rotating Biological Contactors (RBC),
W81-02723 5D

BOTTOM SEDIMENTS
Species Dependent Mass Transport and Chemical Equilibria: Application to Chesapeake Bay Sediments,
W81-02735 2K

BOYLSTON CENTER QUADRANGLE (NY)
Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

BRAZIL
Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

Primary Production of Phytoplankton and Environmental Characteristics of a Shallow Quaternary Lake at Eastern Brazil,
W81-02878 5C

BRINES
Brine Pollution at Fresno - Twenty-Six Years Later,
W81-02843 5B

BRITISH COLUMBIA
Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

CALCIUM CARBONATE
Phosphate Removal with Calcium Carbonate Precipitation in the Lake of Constance (Obersee). (Phosphatelimination Durch Autochthone Calcitfallung Im Bodensee-Obersee),
W81-02882 5D

CALCIUM SULFATE REMOVAL
High Recovery Seed Slurry Reverse Osmosis Demonstration for Desalting Waters Saturated in Calcium Sulfate.
W81-02659 3A

CALIFORNIA
Water Resources Data for California, Water Year 1979--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W81-02672 7C

Water Resources Data for California, Water Year 1979--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W81-02673 7C

A Water-Quality Monitoring Network for Vallecitos Valley, Alameda County, California,
W81-02685 5B

Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California,
W81-02690 5B

Appraisal of Ground-Water Resouces in the San Antonio Creek Valley, Santa Barbara County, California,
W81-02700 6D

Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

Waste Discharge Requirements for Nonsewerable Waste Disposal to Land,
W81-02798 5C

Kelp Beds at Saunders Reef, Mendocino County.
W81-02799 5C

San Diego Marine Life Refuge, San Diego County.
W81-02800 5C

Julia Pfeiffer Burns Underwater Park, Monterey County.
W81-02801 5C

Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

California's Water Conflict: North vs South,
W81-02809 6E

CANADA
The Inadequacy of Existing Chlorophyll-a/ Phosphorus Concentration Correlations for Assessing Remedial Measures for Hypertrophic Lakes,
W81-02856 5C

CANADA WATER ACT
The Politics of Water Pollution Control: A Case Study of the Formation of the Canada Water Act, Part I: Comprehensive Water Resource Management: Part II: Nutrient Control,
W81-02836 6E

CANALS
Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

CARBOHYDRATES
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

CARCINOGENS
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

CATFISH FARMING
Aquaculture: Catfish and Trout, Inventory and Sales, 1980.
W81-02776 8I

CATFISH PONDS
Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

CENTRAL SQUARE QUADRANGLE (NY)
Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

CHANNEL EROSION
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

CHANNEL MORPHOLOGY
Using Channel Geometry to Estimate Flood Flows at Ungaged Sites in Idaho,
W81-02679 6A

CHEMCONTROL
Proceedings of the Workshop on Aquatic Weeds: Control and its Environmental Consequences, Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida, February 25-26, 1980.
W81-02787 4A

CHEMICAL DEGRADATION
Studies on the Photochemical Decomposition of Organomercurials--Methylmercury(II) Chloride,
W81-02816 5B

CHEMICAL OXYGEN DEMAND
The Effect of Heavy Metals on the Performance of Rotating Biological Contactors (RBC),
W81-02723 5D

CHEMICAL PRECIPITATION
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

Phosphate Removal with Calcium Carbonate Precipitation in the Lake of Constance (Obersee). (Phosphatelimination Durch Autochthone Calcitfallung Im Bodensee-Obersee),
W81-02882 5D

CHEMICAL PROPERTIES
Chemical and Physical Characteristics of Water in Estuaries of Texas, October 1974-September 1975,
W81-02684 2L

The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

CHEMICAL REACTIONS
Species Dependent Mass Transport and Chemical Equilibria: Application to Chesapeake Bay Sediments,
W81-02735 2K

CHEMICAL WASTES
Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

CHESAPEAKE BAY
Species Dependent Mass Transport and Chemical Equilibria: Application to Chesapeake Bay Sediments,
W81-02735 2K

Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

CHILE
Some Ecological Observations on Environmental Parameters, Planktonic Seasonal Succession and Biomass in Rio Cruces (Prov. Valdivia), South Chile,
W81-02876 5C

CHLORELLA
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa,
W81-02861 5D

CHLORINATED HYDROCARBONS
Survey and Control of Synthetic Organics in Texas Water Supplies,
W81-02719 5A

Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

CHLORINATION
Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents,
W81-02875 5A

CHLOROPHYLL
The Inadequacy of Existing Chlorophyll-a/ Phosphorus Concentration Correlations for Assessing Remedial Measures for Hypertrophic Lakes,
W81-02856 5C

Phosphorus, Chlorophyll, and Eutrophic Lakes,
W81-02886 5C

CHROMATOGRAPHY
Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography,
W81-02824 5A

Chromatographic Enrichment of Acidic Compounds From Organic Solvents Using Alkali Metal Silicates,
W81-02829 5A

CHROMIUM
Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

CISTERNS
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

CLIMATIC DATA
Hydrologic and Climatologic Data, Southeastern Uinta Basin, Utah, and Colorado, Water Year 1978,
W81-02694 7C

CLIMATOLOGY
Preliminary Analysis of Regional-Precipitation Periodicity,
W81-02687 2B

COAGULATION
The Effect of pH on the Coagulation and Purification of Wastewater,
W81-02832 5D

COAL MINING
Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

COALS
Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

COASTAL MARSHES
Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

COASTAL PLAINS
Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

COASTAL STREAMS
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

COASTAL WATERS
Kelp Beds at Saunders Reef, Mendocino County.
W81-02799 5C

San Diego Marine Life Refuge, San Diego County.
W81-02800 5C

COASTAL WATERS

Organochlorine Compounds in Mussels From Scottish Coastal Waters,
W81-02858 5A

COLIFORMS

Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

COLIPHAGES

Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

COLLIER COUNTY (FL)

Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

COLORADO

Streamflow Statistical Summaries for Colorado Streams Through September 30, 1975, Volume 2: Colorado River Basin Above Gunnison River,
W81-02676 7C

Hydrologic and Climatologic Data, Southeastern Uinta Basin, Utah, and Colorado, Water Year 1978,
W81-02694 7C

COLORADO RIVER BASIN

Hydrologic and Climatologic Data, Southeastern Uinta Basin, Utah, and Colorado, Water Year 1978,
W81-02694 7C

Chemical and Mineralogical Composition and Behavior of the Mancos Shale as a Diffuse Source of Salts in the Upper Colorado River Basin,
W81-02711 5B

COLORADO RIVER BASIN (CO)

Streamflow Statistical Summaries for Colorado Streams Through September 30, 1975, Volume 2: Colorado River Basin Above Gunnison River,
W81-02676 7C

COMBINED SEWER OVERFLOWS

Urban Runoff Receiving Water Impacts: Program Overview and Research Needs,
W81-02748 5C

Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 5C

The Impact of Combined Sewer Overflows on the Dissolved Oxygen Concentration of a Small Stream,
W81-02758 5C

Impacts of Intermittent Urban Discharges on Receiving Waters,
W81-02759 5C

The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

Potential of Urban Stormwater Impacts Based on Comparative Analysis of Wet and Dry Weather Pollutant Loads,
W81-02768 5C

Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

COMBINED SEWERS

The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 5C

COMMERCIAL FISHING

Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

COMMUNITY DEVELOPMENT

Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

COMPUTER MODELS

Estimating Flood Damages in the State of Georgia,
W81-02720 6F

Development of a Streamflow Forecasting Procedure for Intermountain Basins,
W81-02726 6A

Affinity Tests for the Detection of Community Alteration in Plankton: Evaluation With a Distributional Computer Model,
W81-02860 5C

COMPUTER PROGRAMS

Computer Routines for Probability Distributions, Random Numbers, and Related Functions,
W81-02693 6A

COMPUTERS

Principle of Organization of an Automated Information System,
W81-02740 7C

Self-Organization of Three-Dimensional Models of Water Pollution,
W81-02745 5B

CONNECTICUT

Algal Response to Copper Under Riverine Conditions,
W81-02862 5C

CONTAMINATION

An Approach for Assessing the Water Quality Significance of Chemical Contaminants in Urban Lakes,
W81-02749 5C

COOPERATIVES

Directory of Assistance Centers of the National Water Data Exchange (NAWDEX),
W81-02681 10D

COPPER

Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography,
W81-02824 5A

The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

Algal Response to Copper Under Riverine Conditions,
W81-02862 5C

CORN

Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

COST ANALYSIS

Optimal Sampling for Long Term Trends in Lake Huron,
W81-02733 7B

A Water Quality Planning Methodology for Urban Areas,
W81-02771 6B

COST-BENEFIT ANALYSIS

The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

A Water Quality Planning Methodology for Urban Areas,
W81-02771 6B

COWEETA HYDROLOGIC LABORATORY

Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future,
W81-02729 9C

CROP PRODUCTION

Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

Irrigation of Crops in the Southeastern United States, Principles and Practice,
W81-02780 3F

CRUCES RIVER

Some Ecological Observations on Environmental Parameters, Planktonic Seasonal Succession and Biomass in Rio Cruces (Prov. Valdivia), South Chile,
W81-02876 5C

CULTIVATION

Conservation Tillage: Best Management Practice for Nonpoint Runoff,
W81-02818 4D

CYANOPHYTA

Interactions of Light and Nitrogen Source Among Planktonic Blue-Green Algae,
W81-02807 5C

CYCLES

Analyses of South African Rainfall,
W81-02873 2B

DADE COUNTY (FL)

Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

DAM STABILITY

Safety Evaluation of Existing Dams, A Manual for the Safety Evaluation of Embankment and Concrete Dams.
W81-02774 8A

DAMS

Safety Evaluation of Existing Dams, A Manual for the Safety Evaluation of Embankment and Concrete Dams.
W81-02774 8A

Long-Term Consequences of Upstream Impoundment,
W81-02835 6G

DAPHNIA

The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

DATA ACQUISITION
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

DATA COLLECTIONS
Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

Principle of Organization of an Automated Information System,
W81-02740 7C

DATA STORAGE AND RETRIEVAL
Directory of Assistance Centers of the National Water Data Exchange (NAWDEX),
W81-02681 10D

Data Management Requirements for Great Lakes Water Quality Modeling,
W81-02732 7C

DEGRADATION
Modeling Sewage Sludge Decomposition in Soil: 1. Organic Carbon Transformation,
W81-02837 5D

DELAWARE RIVER
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

DELTA-CLEARWATER AREA
Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

DENITRIFICATION
Modeling Sewage Sludge Decomposition in Soil: II. Nitrogen Transformations,
W81-02838 5E

DENMARK
The Impact of Combined Sewer Overflows on the Dissolved Oxygen Concentration of a Small Stream,
W81-02758 5C

DESALINATION
High Recovery Seed Slurry Reverse Osmosis Demonstration for Desalting Waters Saturated in Calcium Sulfate.
W81-02659 3A

DESIGN CRITERIA
Industrial Wastewater Vs. the POTW,
W81-02884 5D

DETECTION LIMITS
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

DETERGENTS
Use of Synthetic Detergents in Malaysia,
W81-02896 5C

DETRITUS
Dynamics of Sediment and Organic Detritus in a Small Chalk Stream,
W81-02879 2J

DISCHARGE MEASUREMENT
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

DISSOLVED OXYGEN
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 * 5C

Dissolved Oxygen Impact from Urban Storm Runoff,
W81-02757 5C

The Impact of Combined Sewer Overflows on the Dissolved Oxygen Concentration of a Small Stream,
W81-02758 5C

DISSOLVED SOLIDS
The Distribution, Transport and Cycling of Dissolved and Particulate Organic Carbon in the Potomac and Anacostia Rivers in the Greater Washington Area,
W81-02656 5B

Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

DISTRIBUTION PATTERNS
Primary Production of Phytoplankton and Environmental Characteristics of a Shallow Quaternary Lake at Eastern Brazil,
W81-02878 5C

DISTRIBUTION SYSTEMS
Scanning Electron Microscope Evidence for Bacterial Colonization of a Drinking-Water Distribution System,
W81-02812 5A

DISTRICT OF COLUMBIA
The Distribution, Transport and Cycling of Dissolved and Particulate Organic Carbon in the Potomac and Anacostia Rivers in the Greater Washington Area,
W81-02656 5B

DOMESTIC WASTES
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

DRINKING WATER
Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation,
W81-02811 5A

Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies,
W81-02848 5A

Simple Method for Concentration of Bacteria From Large Volumes of Tap Water,
W81-02853 5A

DROUGHTS
Preliminary Analysis of Regional-Precipitation Periodicity,
W81-02687 2B

DYNAMIC PROGRAMMING
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

EAST FORK RIVER (WY)
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

ECOLOGICAL EFFECTS
Principle of Organization of an Automated Information System,
W81-02740 7C

The Ecological Effects of Urban Runoff on Stream Communities,
W81-02754 5C

ECOLOGY
Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

ECONOMIC ASPECTS
Phase II Report - Preliminary Investigation of Small-Scale Hydropower Potential at Five Sites in Illinois,
W81-02790 6B

Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

ECONOMIC EVALUATION
The Long Run Profitability of Western Irrigated Agriculture: An In-Depth Analysis,
W81-02655 6C

ECONOMIC IMPACT
Estimating Flood Damages in the State of Georgia,
W81-02720 6F

ECONOMICS
Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

ECOSYSTEMS
A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

The Ecological Effects of Urban Runoff on Stream Communities,
W81-02754 5C

The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

EDDY DIFFUSION
Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions,
W81-02736 5B

EFFLUENTS
Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents,
W81-02875 5A

ELECTRIC POWER PRODUCTION
Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

ENERGY SOURCES
Small Scale Hydropower Development in Illinois: An Implementation Manual,
W81-02788 6B

ENEWETAK ATOLL
Global Transport of Organic Pollutants: Ambient Concentrations in the Remote Marine Atmosphere,
W81-02872 5B

ENTRAINMENT
A Review of Some Methods and Parameters Used in Assessing Effects of Water Intakes on Fish Populations,
W81-02742 5C

ENVIRONMENTAL EFFECTS
Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

Proceedings of the Workshop on Aquatic Weeds: Control and its Environmental Consequences, Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida, February 25-26, 1980.
W81-02787 4A

Long-Term Consequences of Upstream Impoundment,
W81-02835 6G

Environmental Impact of Kraft Plant Effluents on Salmo Salar Ouananiche Analyzed by a New Method, the Coherence Graph. (Evaluation des Impacts Environnementaux Dus Au Rejets D'Une Usine de Pate Kraft Sur Le Salmo Salar Ouananiche A L'Aide D'Une Nouvelle Methode: Le Graphe de Coherence),
W81-02867 5C

ENVIRONMENTAL SURVEYS
Small Scale Hydropower Development in Illinois: An Implementation Manual,
W81-02788 6B

EQUATIONS
Relationships Between Basic Soils-Engineering Equations and Basic Ground-Water Flow Equations,
W81-02708 2F

EROSION
Dynamics of Sediment and Organic Detritus in a Small Chalk Stream,
W81-02879 2J

EROSION CONTROL
Conservation Tillage: Best Management Practice for Nonpoint Runoff,
W81-02818 4D

ESTIMATING EQUATIONS
Using Channel Geometry to Estimate Flood Flows at Ungaged Sites in Idaho,
W81-02679 6A

ESTUARIES
Chemical and Physical Characteristics of Water in Estuaries of Texas, October 1974-September 1975,
W81-02684 2L

Vegetative Propagation of Some Saprolegniaceae Under Simulated-Estuarine-Culture Conditions,
W81-02814 2L

Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum,
W81-02822 2L

Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography,
W81-02824 5A

Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals,
W81-02888 5A

Reconstruction of Maldon STW,
W81-02899 5D

ESTUARINE ENVIRONMENT
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

EUTROPHIC LAKES
An Approach for Assessing the Water Quality Significance of Chemical Contaminants in Urban Lakes,
W81-02749 5C

Phosphorus, Chlorophyll, and Eutrophic Lakes,
W81-02886 5C

EUTROPHICATION
A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

Fungal Pathogen of Cladophora Glomerata (Chlorophyta),
W81-02846 5G

The Inadequacy of Existing Chlorophyll-a/Phosphorus Concentration Correlations for Assessing Remedial Measures for Hypertrophic Lakes,
W81-02856 5C

Phosphorus, Chlorophyll, and Eutrophic Lakes,
W81-02886 5C

Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

Use of Synthetic Detergents in Malaysia,
W81-02896 5C

FAUNA
The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

FEASIBILITY STUDIES
The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

Phase II Report - Preliminary Investigation of Small-Scale Hydropower Potential at Five Sites in Illinois,
W81-02790 6B

FEEDLOT RUNOFF
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

FERRIC CHLORIDE
The Effect of pH on the Coagulation and Purification of Wastewater,
W81-02832 5D

FERTILIZERS
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

FILTERS
Simple Method for Concentration of Bacteria From Large Volumes of Tap Water,
W81-02853 5A

FISH FARMING
Aquaculture: Catfish and Trout, Inventory and Sales, 1980.
W81-02776 8I

Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

FISH HATCHERIES
A Solar Heated Fish Hatchery Water Recycling System,
W81-02709 8I

Temperature-Controlled Recirculating System for Hatching Catostomid Larvae,
W81-02728 8I

FISH HATCHING SYSTEM
Temperature-Controlled Recirculating System for Hatching Catostomid Larvae,
W81-02728 8I

FISH POPULATIONS
A Review of Some Methods and Parameters Used in Assessing Effects of Water Intakes on Fish Populations,
W81-02742 5C

Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

FLOCCULATION
Multi Stage Flocculation Treatment System,
W81-02805 5D

Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

FLOOD DAMAGE
Estimating Flood Damages in the State of Georgia,
W81-02720 6F

FLOOD DATE
Estimating Flood Damages in the State of Georgia,
W81-02720 6F

FLOOD FLOW
Using Channel Geometry to Estimate Flood Flows at Ungaged Sites in Idaho,
W81-02679 6A

FLOOD FREQUENCY
Using Channel Geometry to Estimate Flood Flows at Ungaged Sites in Idaho,
W81-02679 6A

Evaluation of Peak-Flow Data Network of Small Streams in Missouri,
W81-02689 2E

Flood Frequency Modeling and Outliers,
W81-02803 2E

FLORIDA
Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

Impacts of Stormwater Runoff on a Florida Lake Ecosystem: Effects on Water Quality and Biota,
W81-02752 5C

FLUORIDES
Geochemistry of Fluoride in the Black Creek Aquifer System of Horry and Georgetown Counties, South Carolina--and its Physiological Implications,
W81-02677 5G

FLUROIDES
The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

FLUVIAL SEDIMENTS
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

FLY ASH
Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

Effects of Fly Ash Heavy Metals on Daphnia Magna,
W81-02715 5B

FOREST WATERSHEDS
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

FORESTRY
Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future,
W81-02729 9C

FRANCE
Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals,
W81-02888 5A

FRESNO
Brine Pollution at Fresno - Twenty-Six Years Later,
W81-02843 5B

FUEL
The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

FUNGI
Vegetative Propagation of Some Saprolegniaceae Under Simulated-Estuarine-Culture Conditions,
W81-02814 2L

GAGING STATIONS
Streamflow Statistical Summaries for Colorado Streams Through September 30, 1975, Volume 2: Colorado River Basin Above Gunnison River,
W81-02676 7C

GAS CHROMATOGRAPHY
GC/MS Methodology for Measuring Priority Organics in Municipal Waste Water Treatment,
W81-02784 5A

GEOCHEMISTRY
Geochemistry of Fluoride in the Black Creek Aquifer System of Horry and Georgetown Counties, South Carolina--and its Physiological Implications,
W81-02677 5G

Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum,
W81-02822 2L

GEOLOGY
Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

GEORGIA
Estimating Flood Damages in the State of Georgia,
W81-02720 6F

GLACIAL AQUIFERS
Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

GLUCOSE
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

GRAPHICAL ANALYSIS
Environmental Impact of Kraft Plant Effluents on Salmo Salar Ouananiche Analyzed by a New Method, the Coherence Graph. (Evaluation des Impacts Environnementaux Dus Au Rejets D'Une Usine de Pate Kraft Sur Le Salmo Salar Ouananiche A L'Aide D'Une Nouvelle Methode: Le Graphe de Coherence),
W81-02867 5C

GREAT BASIN
Water Resources Data for California, Water Year 1979--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W81-02673 7C

GREAT BRITAIN
The Statistical Distribution of Sewage and Sludge Analyses,
W81-02817 5A

Reconstruction of Maldon STW,
W81-02899 5D

GREAT LAKES
Modeling the Great Lakes - A History of Achievement,
W81-02731 7A

Data Management Requirements for Great Lakes Water Quality Modeling,
W81-02732 7C

GREAT LAKES ESTUARIES
The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

GROUNDWATER
Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

Water Resources Data for California, Water Year 1979--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W81-02672 7C

Water Resources Data for California, Water Year 1979--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W81-02673 7C

Water Resources Data for Louisiana, Water Year 1980--Volume 2. Southern Louisiana.
W81-02674 7C

Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

Geochemistry of Fluoride in the Black Creek Aquifer System of Horry and Georgetown Counties, South Carolina--and its Physiological Implications,
W81-02677 5G

Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

Selected Chemical Quality Characteristics in Streams of Kentucky, 1970-75.
W81-02680 2K

Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

Water Resources Data for Nevada, Water Year 1979.
W81-02698 7C

Water Resources Data for Alabama, Water Year 1979--Volume 1. Apalachicola, Choctawatchee, Blackwater, Escambia, Perdido, and Alabama River Basins.
W81-02706 7C

Water Resources Data for Alabama, Water Year 1979--Volume 2. Tombigbee, Mobile, Dog, Pascagoula, and Tennessee River Basins.
W81-02707 7C

Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

GROUNDWATER AVAILABILITY
Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California,
W81-02690 5B

Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

GROUNDWATER BASINS
Development of a Groundwater Model for the Henry's Fork and Rigby Fan Areas, Upper Snake River Basin, Idaho,
W81-02804 6A

GROUNDWATER MANAGEMENT
Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

GROUNDWATER MOVEMENT
Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California,
W81-02690 5B

Relationships Between Basic Soils-Engineering Equations and Basic Ground-Water Flow Equations,
W81-02708 2F

GROUNDWATER POLLUTION
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

Effects of Coal-Ash Leachate on Ground Water Quality,
W81-02785 5B

Waste Discharge Requirements for Nonsewerable Waste Disposal to Land,
W81-02798 5C

Groundwater Contamination Potential at 21 Industrial Waste-Water Impoundments in Ohio,
W81-02841 5B

Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

Brine Pollution at Fresno - Twenty-Six Years Later,
W81-02843 5B

GROUNDWATER POTENTIAL
Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

GROUNDWATER RESOURCES
Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

Appraisal of Ground-Water Resouces in the San Antonio Creek Valley, Santa Barbara County, California,
W81-02700 6D

Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

GULF OF MEXICO
Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

HAWAII
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

HAZARDOUS WASTES
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

HEAVY METALS
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

Effects of Fly Ash Heavy Metals on Daphnia Magna,
W81-02715 5B

The Effect of Heavy Metals on the Performance of Rotating Biological Contactors (RBC),
W81-02723 5D

Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,
W81-02868 5B

The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments,
W81-02887 5C

Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals,
W81-02888 5A

Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

HERBICIDES
Evidence for Cometabolism in Sewage,
W81-02849 5B

HIGH PLAINS AQUIFER
Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

HUDSON BAY
Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

HYDROCARBONS
The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

HYDRODYNAMICS
Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

HYDROELECTRIC PLANTS
Small Scale Hydropower Development in Illinois: An Implementation Manual,
W81-02788 6B

Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

HYDROELECTRIC POWER
Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

Phase II Report - Preliminary Investigation of Small-Scale Hydropower Potential at Five Sites in Illinois,
W81-02790 6B

HYDROGEN ION CONCENTRATION
The Effect of pH on the Coagulation and Purification of Wastewater,
W81-02832 5D

HYDROGEOLOGY
Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

Study Plan for the Regional Aquifer-System Analysis of Alluvial Basins in South-Central Arizona and Adjacent States,
W81-02701 6A

HYDROLOGIC CYCLE
Preliminary Analysis of Regional-Precipitation Periodicity,
W81-02687 2B

HYDROLOGIC DATA
Water Resources Data for California, Water Year 1979--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W81-02672 7C

Water Resources Data for California, Water Year 1979--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W81-02673 7C

Water Resources Data for Louisiana, Water Year 1980--Volume 2. Southern Louisiana.
W81-02674 7C

Streamflow Statistical Summaries for Colorado Streams Through September 30, 1975, Volume 2: Colorado River Basin Above Gunnison River,
W81-02676 7C

Hydrologic and Climatologic Data, Southeastern Uinta Basin, Utah, and Colorado, Water Year 1978,
W81-02694 7C

Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

Water Resources Data for Nevada, Water Year 1979.
W81-02698 7C

Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

Water Resources Data for Alabama, Water Year 1979--Volume 1. Apalachicola, Choctawatchee, Blackwater, Escambia, Perdido, and Alabama River Basins.
W81-02706 7C

Water Resources Data for Alabama, Water Year 1979--Volume 2. Tombigbee, Mobile, Dog, Pascagoula, and Tennessee River Basins.
W81-02707 7C

HYDROLOGY
Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future,
W81-02729 9C

HYDROXYLAPATITE
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

IDAHO
Using Channel Geometry to Estimate Flood Flows at Ungaged Sites in Idaho,
W81-02679 6A

Development of a Groundwater Model for the Henry's Fork and Rigby Fan Areas, Upper Snake River Basin, Idaho,
W81-02804 6A

ILLINOIS
Small Scale Hydropower Development in Illinois: An Implementation Manual,
W81-02788 6B

Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

Phase II Report - Preliminary Investigation of Small-Scale Hydropower Potential at Five Sites in Illinois,
W81-02790 6B

Bank Erosion of the Illinois River,
W81-02791 2J

Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

Physical, Chemical, and Biological Characteristics of Lake Ellyn Sediments.
W81-02793 2H

Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

Flood Frequency Modeling and Outliers,
W81-02803 2E

ILLINOIS RIVER
Bank Erosion of the Illinois River,
W81-02791 2J

IMPAIRED WATER USE
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

IMPARIED WATER USE
Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

IMPOUNDMENTS
Long-Term Consequences of Upstream Impoundment,
W81-02835 6G

INCINERATION
Atmospheric Emissions of Elements on Particles From the Parkway Sewage-Sludge Incinerator,
W81-02855 5E

INDEXING
Directory of Assistance Centers of the National Water Data Exchange (NAWDEX),
W81-02681 10D

Water Resources Thesaurus, Third Edition.
W81-02718 10C

INDIA
Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

INDIANA
Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

INDUSTRIAL WASTE WATER
Caprolactam Recovery from Aqueous Manufacturing Streams,
W81-02783 5D

The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

INDUSTRIAL WASTES
Groundwater Contamination Potential at 21 Industrial Waste-Water Impoundments in Ohio,
W81-02841 5B

Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

Algal Response to Copper Under Riverine Conditions,
W81-02862 5C

The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

Industrial Wastewater Vs. the POTW,
W81-02884 5D

INDUSTRIAL WATER USE
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

INFILTRATION
Permeability of Covers Over Low-Level Radioactive-Waste Burial Trenches, West Valley, Cattaraugus County, New York,
W81-02692 5E

INFORMATION EXCHANGE
Directory of Assistance Centers of the National Water Data Exchange (NAWDEX),
W81-02681 10D

INFORMATION RETRIEVAL
Water Resources Thesaurus, Third Edition.
W81-02718 10C

INFORMATION SYSTEMS
Water Resources Thesaurus, Third Edition.
W81-02718 10C

Principle of Organization of an Automated Information System,
W81-02740 7C

INFRARED IMAGERY
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

INSPECTION
Safety Evaluation of Existing Dams, A Manual for the Safety Evaluation of Embankment and Concrete Dams.
W81-02774 8A

INSTREAM FLOW
The WRRI Trout Cover Rating Method: Development and Application,
W81-02717 8I

INTAKES
A Review of Some Methods and Parameters Used in Assessing Effects of Water Intakes on Fish Populations,
W81-02742 5C

INVERTEBRATES
Behavioral and Catastrophic Drift of Invertebrates in Two Streams in Northeastern Wyoming,
W81-02702 2E

Thermal Tolerance of the Isopod Lirceus Brachyurus (Crustacea:Isopoda),
W81-02810 5C

Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

Long-Term Consequences of Upstream Impoundment,
W81-02835 6G

INVESTIGATIONS
Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

ION EXCHANGE
An Ion-Exchange Technique for Concentrating Ammonia From Small Volumes of Seawater,
W81-02823 5A

IRON BACTERIA
Scanning Electron Microscope Evidence for Bacterial Colonization of a Drinking-Water Distribution System,
W81-02812 5A

IRRIGATION
Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

Waste Water Spray Transport in Land Application,
W81-02722 3F

IRRIGATION EFFICIENCY
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

Application of Wind Energy to Great Plains Irrigation Pumping,
W81-02781 8C

IRRIGATION PRACTICES
The Long Run Profitability of Western Irrigated Agriculture: An In-Depth Analysis,
W81-02655 6C

Irrigation of Crops in the Southeastern United States, Principles and Practice,
W81-02780 3F

IRRIGATION WELLS
Application of Wind Energy to Great Plains Irrigation Pumping,
W81-02781 8C

ISOPODS
Thermal Tolerance of the Isopod Lirceus Brachyurus (Crustacea:Isopoda),
W81-02810 5C

ISRAEL
Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

JAMES BAY
Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

JAMES CITY COUNTY
Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

JAPAN
Molecular Weight Distribution and Characterization of Dissolved Organic Matter From Lake Waters,
W81-02877 2H

Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

JULIA PFEIFFER BURNS UNDERWATER PARK
Julia Pfeiffer Burns Underwater Park, Monterey County.
W81-02801 5C

KANSAS
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

KELPS
Kelp Beds at Saunders Reef, Mendocino County.
W81-02799 5C

KENTUCKY
Selected Chemical Quality Characteristics in Streams of Kentucky, 1970-75.
W81-02680 2K

LAKE CONWAY (FL)
Impacts of Stormwater Runoff on a Florida Lake Ecosystem: Effects on Water Quality and Biota,
W81-02752 5C

LAKE EOLA
Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

LAKE ERIE
The Transport of Contaminants in Lake Erie,
W81-02744 5B

A Two-Mode Free-Surface Numerical Model for the Three-Dimensional Time-Dependent Currents in Large Lakes,
W81-02778 2H

LAKE HURON
Optimal Sampling for Long Term Trends in Lake Huron,
W81-02733 7B

A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

LAKE JACKSON
The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

LAKE LANSING
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

LAKE MORPHOLOGY
Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

LAKE MORPHOMETRY
Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

LAKE NAINITAL (INDIA)
Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

LAKE SEDIMENTS
Physical, Chemical, and Biological Characteristics of Lake Ellyn Sediments.
W81-02793 2H

LAKE SUPERIOR
Transport of Mining Waste in Lake Superior,
W81-02739 5B

A Multi-Layered Nested Grid Model of Lake Superior,
W81-02741 2H

LAKE WASHINGTON
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

LAKES
Mechanisms by Which Acid Precipitation Produces Embryonic Death in Aquatic Vertebrates,
W81-02716 5C

Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions,
W81-02736 5B

The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

Growth Responses of Yellow Perch, Perca Flavescens (Mitchill), to Lake Acidification in the La Cloche Mountain Lakes of Ontario,
W81-02833 5C

The Inadequacy of Existing Chlorophyll-a/Phosphorus Concentration Correlations for Assessing Remedial Measures for Hypertrophic Lakes,
W81-02856 5C

Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

Molecular Weight Distribution and Characterization of Dissolved Organic Matter From Lake Waters,
W81-02877 2H

Primary Production of Phytoplankton and Environmental Characteristics of a Shallow Quaternary Lake at Eastern Brazil,
W81-02878 5C

The Macrobenthos of Lakes Rotoroa and Rotoiti, South Island, New Zeland, With Special Reference to the Influence of Allochthonous Organic Detritus,
W81-02880 2H

Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

LAKES HYDROLOGIC SYSTEMS

A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

LAND USE

Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

LANDFILLS

Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

LEACHATE

Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

LEACHATES

Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

LEACHING

Effects of Coal-Ash Leachate on Ground Water Quality,
W81-02785 5B

Chemical Treatments of Soil to Decrease Radiostrontium Leachability,
W81-02826 5G

LEAD

Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation,
W81-02811 5A

The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

LEGISLATION

California's Water Conflict: North vs South,
W81-02809 6E

LIGHT PENETRATION

Interactions of Light and Nitrogen Source Among Planktonic Blue-Green Algae,
W81-02807 5C

LIPIDS

Detection of Lipid Degradation Products in the Water of a Reservoir During a Bloom of Synura Uvella,
W81-02850 5A

LIRCEUS BRACHYURUS

Thermal Tolerance of the Isopod Lirceus Brachyurus (Crustacea:Isopoda),
W81-02810 5C

LITERATURE REVIEW

Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

LIVERPOOL

The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments,
W81-02887 5C

LOUISANA

Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

LOUISIANA

Water Resources Data for Louisiana, Water Year 1980--Volume 2. Southern Louisiana.
W81-02674 7C

LYSANDER QUADRANGLE (NY)

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

MALAYSIA

Use of Synthetic Detergents in Malaysia,
W81-02896 5C

MANGANESE

Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

MAPS

Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

MARINE BACTERIA

Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

MARINE BIOLOGY

Kelp Beds at Saunders Reef, Mendocino County.
W81-02799 5C

San Diego Marine Life Refuge, San Diego County.
W81-02800 5C

Julia Pfeiffer Burns Underwater Park, Monterey County.
W81-02801 5C

MARINE FISHERIES

Julia Pfeiffer Burns Underwater Park, Monterey County.
W81-02801 5C

MARINE ORGANISMS

The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

MASS SPECTROMETRY

GC/MS Methodology for Measuring Priority Organics in Municipal Waste Water Treatment,
W81-02784 5A

MASS TRANSFER

Species Dependent Mass Transport and Chemical Equilibria: Application to Chesapeake Bay Sediments,
W81-02735 2K

MATHEMATICAL MODELS

Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

Transport of Mining Waste in Lake Superior,
W81-02739 5B

A Multi-Layered Nested Grid Model of Lake Superior,
W81-02741 2H

The Transport of Contaminants in Lake Erie,
W81-02744 5B

Self-Organization of Three-Dimensional Models of Water Pollution,
W81-02745 5B

A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

Continuous Receiving Water Quality Modeling for Urban Stormwater Management,
W81-02767 5C

Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

A Two-Mode Free-Surface Numerical Model for the Three-Dimensional Time-Dependent Currents in Large Lakes,
W81-02778 2H

MECHANICAL CONTROL

Proceedings of the Workshop on Aquatic Weeds: Control and its Environmental Consequences, Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida, February 25-26, 1980.
W81-02787 4A

MEDITERRANEAN SEA

Phosphorus and Nitrogen in the Mediterranean Sea: Budgets and Potential Fertility. (Le Phosphore et L'Azote En Mer Mediterranee, Bilans et Fertilite Potentielle),
W81-02891 5B

MEMBRANE PROCESSES

High Recovery Seed Slurry Reverse Osmosis Demonstration for Desalting Waters Saturated in Calcium Sulfate.
W81-02659 3A

Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

MERCURY
Studies on the Photochemical Decomposition of Organomercurials--Methylmercury(II) Chloride,
W81-02816 5B

MESOTROPHIC LAKES
Impacts of Stormwater Runoff on a Florida Lake Ecosystem: Effects on Water Quality and Biota,
W81-02752 5C

METABOLISM
Evidence for Cometabolism in Sewage,
W81-02849 5B

METAL-FINISHING WASTES
Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

METALS
The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

METEOROLOGY
Preliminary Analysis of Regional-Precipitation Periodicity,
W81-02687 2B

METHYLMERCURY
Studies on the Photochemical Decomposition of Organomercurials--Methylmercury(II) Chloride,
W81-02816 5B

MEXICO QUADRANGLE (NY)
Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

MICROORGANISMS
Biodegradation of Chemicals of Environmental Concern,
W81-02871 5B

Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

MILWAUKEE RIVER
Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 5C

MINE WASTES
Transport of Mining Waste in Lake Superior,
W81-02739 5B

Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

MINERALOGY
Chemical and Mineralogical Composition and Behavior of the Mancos Shale as a Diffuse Source of Salts in the Upper Colorado River Basin,
W81-02711 5B

MISSOURI
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

Evaluation of Peak-Flow Data Network of Small Streams in Missouri,
W81-02689 2E

Industrial Wastewater Vs. the POTW,
W81-02884 5D

MODEL STUDIES
Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

Modeling the Great Lakes - A History of Achievement,
W81-02731 7A

Data Management Requirements for Great Lakes Water Quality Modeling,
W81-02732 7C

Optimal Sampling for Long Term Trends in Lake Huron,
W81-02733 7B

A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

Self-Organization of Three-Dimensional Models of Water Pollution,
W81-02745 5B

A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 5C

The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

A Two-Mode Free-Surface Numerical Model for the Three-Dimensional Time-Dependent Currents in Large Lakes,
W81-02778 2H

Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

Modeling Sewage Sludge Decomposition in Soil: 1. Organic Carbon Transformation,
W81-02837 5D

Modeling Sewage Sludge Decomposition in Soil: II. Nitrogen Transformations,
W81-02838 5E

MOLLUSKS
Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

MONITORING
A Water-Quality Monitoring Network for Vallecitos Valley, Alameda County, California,
W81-02685 5B

MONONGAHELA RIVER
The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

MONTANA
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

MORTALITY
A Review of Some Methods and Parameters Used in Assessing Effects of Water Intakes on Fish Populations,
W81-02742 5C

MOST PROBABLE NUMBER TEST
Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

MULTIVARIATE ANALYSIS
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

MUNICIPAL WASTE WATER
GC/MS Methodology for Measuring Priority Organics in Municipal Waste Water Treatment,
W81-02784 5A

MUNICIPAL WATER
The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water,
W81-02831 6C

MUSSELS
Measurement of Physiological Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

Organochlorine Compounds in Mussels From Scottish Coastal Waters,
W81-02858 5A

NAIADS
Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

NARRAGANSETT BAY
Measurement of Physiological Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography,
W81-02824 5A

NATIONAL WATER DATA EXCHANGE (NAWDEX)
Directory of Assistance Centers of the National Water Data Exchange (NAWDEX),
W81-02681 10D

NEBRASKA
Public Attitudes of Nebraskans Toward Water Policy,
W81-02725 6E

NEVADA
Water Resources Data for Nevada, Water Year 1979.
W81-02698 7C

NEW HAVEN QUADRANGLE (NY)
Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

NEW MEXICO
Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

NEW YORK
Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

Permeability of Covers Over Low-Level Radioactive-Waste Burial Trenches, West Valley, Cattaraugus County, New York,
W81-02692 5E

NEW ZEALAND
The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

The Macrobenthos of Lakes Rotoroa and Rotoiti, South Island, New Zeland, With Special Reference to the Influence of Allochthonous Organic Detritus,
W81-02880 2H

NIGERIA
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

NITRATE
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

NITRATES
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

NITRIFICATION
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

NITRILOTRIACETIC ACID
Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,
W81-02868 5B

NITROGEN
Phosphorus and Nitrogen in the Mediterranean Sea: Budgets and Potential Fertility. (Le Phosphore et L'Azote En Mer Mediterranee, Bilans et Fertilite Potentielle),
W81-02891 5B

NITROGEN COMPOUNDS
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils,
W81-02866 5A

NITROGEN CYCLE
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

NITROGEN FIXATION
Interactions of Light and Nitrogen Source Among Planktonic Blue-Green Algae,
W81-02807 5C

NORTH CAROLINA
Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

NUCLEAR POWERPLANTS
Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

Non-Radiological Environmental Implications of Nuclear Energy,
W81-02895 5C

NUCLEAR WASTES
Chemical Treatments of Soil to Decrease Radiostrontium Leachability,
W81-02826 5G

NUTRIENT REMOVAL
The Politics of Water Pollution Control: A Case Study of the Formation of the Canada Water Act, Part I: Comprehensive Water Resource Management: Part II: Nutrient Control,
W81-02836 6E

NUTRIENTS
An Approach for Assessing the Water Quality Significance of Chemical Contaminants in Urban Lakes,
W81-02749 5C

A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

Impacts of Stormwater Runoff on a Florida Lake Ecosystem: Effects on Water Quality and Biota,
W81-02752 5C

ODOR
Detection of Lipid Degradation Products in the Water of a Reservoir During a Bloom of Synura Uvella,
W81-02850 5A

OHIO
Groundwater Contamination Potential at 21 Industrial Waste-Water Impoundments in Ohio,
W81-02841 5B

Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

OHIO RIVER BASIN (PA)
Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

OIL POLLUTION
Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

Coal-Liquefaction Products, Shale Oil, and Petroleum. Acute Toxicity to Freshwater Algae,
W81-02854 5C

OIL SPILLS
Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

OKLAHOMA
Selected Water-Level Records for Oklahoma, 1979-80,
W81-02683 2F

OLIGOTROPHY
Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

ONTARIO
Growth Responses of Yellow Perch, Perca Flavescens (Mitchill), to Lake Acidification in the La Cloche Mountain Lakes of Ontario,
W81-02833 5C

OPTICAL PROPERTIES
Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

OREGON
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

ORGANIC CARBON
The Distribution, Transport and Cycling of Dissolved and Particulate Organic Carbon in the Potomac and Anacostia Rivers in the Greater Washington Area,
W81-02656 5B

ORGANIC COMPOUNDS
GC/MS Methodology for Measuring Priority Organics in Municipal Waste Water Treatment,
W81-02784 5A

Detection of Lipid Degradation Products in the Water of a Reservoir During a Bloom of Synura Uvella,
W81-02850 5A

Utilization of Low Concentrations of Starch by a Flavobacterium Species Isolated From Tap Water,
W81-02851 5A

The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils,
W81-02866 5A

Biodegradation of Chemicals of Environmental Concern,
W81-02871 5B

ORGANIC COMPOUNDS

Global Transport of Organic Pollutants: Ambient Concentrations in the Remote Marine Atmosphere,
W81-02872 5B

Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

ORGANIC MATTER
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography,
W81-02824 5A

Molecular Weight Distribution and Characterization of Dissolved Organic Matter From Lake Waters,
W81-02877 2H

ORWELL QUADRANGLE (NY)
Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

OSWEGO COUNTY (NY)
Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

OSWEGO EAST QUADRANGLE (NY)
Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

OSWEGO WEST QUADRANGLE (NY)
Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

OVERLAND FLOW
Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

PACIFIC SLOPE BASINS
Water Resources Data for California, Water Year 1979--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W81-02672 7C

PAKISTAN
Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

PAPER PULP WASTES
Environmental Impact of Kraft Plant Effluents on Salmo Salar Ouananiche Analyzed by a New Method, the Coherence Graph. (Evaluation des Impacts Environnementaux Dus Au Rejets D'Une Usine de Pate Kraft Sur Le Salmo Salar Ouananiche A L'Aide D'Une Nouvelle Methode: Le Graphe de Coherence),
W81-02867 5C

PARTICULATE MATTER
The Distribution, Transport and Cycling of Dissolved and Particulate Organic Carbon in the Potomac and Anacostia Rivers in the Greater Washington Area,
W81-02656 5B

Transport of Mining Waste in Lake Superior,
W81-02739 5B

PATENTS
Process for Removal of Discrete Particulates and Solutes from Liquids by Foam Flotation,
W81-02660 5D

Multi Stage Flocculation Treatment System,
W81-02805 5D

PATH OF POLLUTANTS
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,
W81-02868 5B

Biodegradation of Chemicals of Environmental Concern,
W81-02871 5B

Global Transport of Organic Pollutants: Ambient Concentrations in the Remote Marine Atmosphere,
W81-02872 5B

PATHOGENIC BACTERIA
Waste Water Spray Transport in Land Application,
W81-02722 3F

PEAK DISCHARGE
Evaluation of Peak-Flow Data Network of Small Streams in Missouri,
W81-02689 2E

PENNSYLVANIA
Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

Sediment Characteristics of Eleocharis Acicularis (L.) R. S. Sites in Streams and Lakes of Central Pennsylvania,
W81-02821 5C

PERCH
Growth Responses of Yellow Perch, Perca Flavescens (Mitchill), to Lake Acidification in the La Cloche Mountain Lakes of Ontario,
W81-02833 5C

PERIPHERAL CANAL
California's Water Conflict: North vs South,
W81-02809 6E

PERMEABILITY
Permeability of Covers Over Low-Level Radioactive-Waste Burial Trenches, West Valley, Cattaraugus County, New York,
W81-02692 5E

PESTICIDE RESIDUES
Organochlorine Compounds in Mussels From Scottish Coastal Waters,
W81-02858 5A

PHENOLS
Chromatographic Enrichment of Acidic Compounds From Organic Solvents Using Alkali Metal Silicates,
W81-02829 5A

PHOSPHATES
The Politics of Water Pollution Control: A Case Study of the Formation of the Canada Water Act, Part I: Comprehensive Water Resource Management: Part II: Nutrient Control,
W81-02836 6E

PHOSPHORUS
Phosphate Removal with Calcium Carbonate Precipitation in the Lake of Constance (Obersee). (Phosphatelimination Durch Autochthone Calcitfallung Im Bodensee-Obersee),
W81-02882 5D

Phosphorus and Nitrogen in the Mediterranean Sea: Budgets and Potential Fertility. (Le Phosphore et L'Azote En Mer Mediterranee, Bilans et Fertilite Potentielle),
W81-02891 5B

PHOSPHORUS COMPOUNDS
Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

Phosphorus, Chlorophyll, and Eutrophic Lakes,
W81-02886 5C

PHOSPHORUS REMOVAL
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

PHYSICAL PROPERTIES
Chemical and Physical Characteristics of Water in Estuaries of Texas, October 1974-September 1975,
W81-02684 2L

PHYTOPLANKTON
A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

Affinity Tests for the Detection of Community Alteration in Plankton: Evaluation With a Distributional Computer Model,
W81-02860 5C

Some Ecological Observations on Environmental Parameters, Planktonic Seasonal Succession and Biomass in Rio Cruces (Prov. Valdivia), South Chile,
W81-02876 5C

Primary Production of Phytoplankton and Environmental Characteristics of a Shallow Quaternary Lake at Eastern Brazil,
W81-02878 5C

PILOT PLANTS
Caprolactam Recovery from Aqueous Manufacturing Streams,
W81-02783 5D

PIPE FLOW
Algorithms for Pipe Network Analysis and Their Reliability,
W81-02658 8C

PLANKTON
Interactions of Light and Nitrogen Source Among Planktonic Blue-Green Algae,
W81-02807 5C

PLASMIDS
Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

PLATING INDUSTRY
Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

POLAND
Poland Launches Major Program to Restore and Regulate Country's Largest River System,
W81-02889 5D

POLICY MAKING
Public Attitudes of Nebraskans Toward Water Policy,
W81-02725 6E

POLLUTANT IDENTIFICATION
Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation,
W81-02811 5A

Scanning Electron Microscope Evidence for Bacterial Colonization of a Drinking-Water Distribution System,
W81-02812 5A

Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils,
W81-02866 5A

Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

POLLUTANTS
Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions,
W81-02736 5B

Brine Pollution at Fresno - Twenty-Six Years Later,
W81-02843 5B

POLLUTION LOAD
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

POLYCHAETES
The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments,
W81-02887 5C

POPLAR RIVER (MT)
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

POPULATION DYNAMICS
A Review of Some Methods and Parameters Used in Assessing Effects of Water Intakes on Fish Populations,
W81-02742 5C

POTABLE WATER
Utilization of Low Concentrations of Starch by a Flavobacterium Species Isolated From Tap Water,
W81-02851 5A

POWERPLANTS
Effects of Coal-Ash Leachate on Ground Water Quality,
W81-02785 5B

Non-Radiological Environmental Implications of Nuclear Energy,
W81-02895 5C

PRECIPITATION (ATMOSPHERIC)
Preliminary Analysis of Regional-Precipitation Periodicity,
W81-02687 2B

PREDICTION
The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

PRICING
The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water,
W81-02831 6C

PROBABILITY DISTRIBUTION
Computer Routines for Probability Distributions, Random Numbers, and Related Functions,
W81-02693 6A

PROCESS WATER
Caprolactam Recovery from Aqueous Manufacturing Streams,
W81-02783 5D

PRODUCTIVITY
Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

PROFIT
The Long Run Profitability of Western Irrigated Agriculture: An In-Depth Analysis,
W81-02655 6C

PROJECT PLANNING
Study Plan for the Regional Aquifer-System Analysis of Alluvial Basins in South-Central Arizona and Adjacent States,
W81-02701 6A

PROSPERITY RESERVOIR (MO)
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

PUBLIC HEALTH
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

PUBLIC OPINION
Public Attitudes of Nebraskans Toward Water Policy,
W81-02725 6E

PUGET SOUND
Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

PULP WASTES
Clay is Mosinee's Choice for Reducing TSS Discharge from Clarifier,
W81-02874 5D

Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents,
W81-02875 5A

PUMPING
Application of Wind Energy to Great Plains Irrigation Pumping,
W81-02781 8C

RADIOACTIVE WASTE DISPOSAL
Permeability of Covers Over Low-Level Radioactive-Waste Burial Trenches, West Valley, Cattaraugus County, New York,
W81-02692 5E

RADIOACTIVE WASTES
A Water-Quality Monitoring Network for Vallecitos Valley, Alameda County, California,
W81-02685 5B

RADIOISOTOPES
A Water-Quality Monitoring Network for Vallecitos Valley, Alameda County, California,
W81-02685 5B

Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

RAINFALL
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

Analyses of South African Rainfall,
W81-02873 2B

RAW WATER
Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies,
W81-02848 5A

RECLAIMED WATER
Water Quality of a Reservoir Used for Reclaimed Water Storage,
W81-02712 5G

RECREATION WASTES
Hoover Dam Advanced Waste Treatment System; Volume I, Pilot Studies Report.
W81-02772 5D

REDFIELD QUADRANGLE (NY)
Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

REDWATER RIVER (MT)
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and

Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

REEFS
Kelp Beds at Saunders Reef, Mendocino County.
W81-02799 5C

REGIONAL ANALYSIS
Study Plan for the Regional Aquifer-System Analysis of Alluvial Basins in South-Central Arizona and Adjacent States,
W81-02701 6A

REGIONAL DEVELOPMENT
Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems,
W81-02743 6A

REMOTE SENSING
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

RESEARCH
USGS: Its Water Resources Research Activity,
W81-02839 9C

RESEARCH FACILITIES
Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future,
W81-02729 9C

USGS: Its Water Resources Research Activity,
W81-02839 9C

RESEARCH PRIORITIES
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

RESERVOIR RELEASES
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

RESERVOIR SITES
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

RESERVOIRS
Water Quality of a Reservoir Used for Reclaimed Water Storage,
W81-02712 5G

Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions,
W81-02736 5B

Detection of Lipid Degradation Products in the Water of a Reservoir During a Bloom of Synura Uvella,
W81-02850 5A

REVERSE OSMOSIS
High Recovery Seed Slurry Reverse Osmosis Demonstration for Desalting Waters Saturated in Calcium Sulfate.
W81-02659 3A

Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

Hoover Dam Advanced Waste Treatment System; Volume I, Pilot Studies Report.
W81-02772 5D

Hoover Dam Advanced Waste Treatment System: Volume II, Pilot Studies Summary Data.
W81-02773 5D

Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

RIO DE JANEIRO
Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

RIVER BASINS
Development of a Groundwater Model for the Henry's Fork and Rigby Fan Areas, Upper Snake River Basin, Idaho,
W81-02804 6A

RIVER FLOW
The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

RIVERS
Bank Erosion of the Illinois River,
W81-02791 2J

Algal Response to Copper Under Riverine Conditions,
W81-02862 5C

Poland Launches Major Program to Restore and Regulate Country's Largest River System,
W81-02889 5D

ROOTED AQUATIC PLANTS
Sediment Characteristics of Eleocharis Acicularis (L.) R. S. Sites in Streams and Lakes of Central Pennsylvania,
W81-02821 5C

RUNOFF
Statistics of Receiving Water Response to Runoff,
W81-02766 5C

RUNOFF FORECASTING
Development of a Streamflow Forecasting Procedure for Intermountain Basins,
W81-02726 6A

RUSSIA
A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems,
W81-02743 6A

A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

SAFETY
Safety Evaluation of Existing Dams, A Manual for the Safety Evaluation of Embankment and Concrete Dams.
W81-02774 8A

SALINE WATER INTRUSION
Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California,
W81-02690 5B

SALINITY
Chemical and Mineralogical Composition and Behavior of the Mancos Shale as a Diffuse Source of Salts in the Upper Colorado River Basin,
W81-02711 5B

SALT MARSHES
Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

SAM RAYBURN RESERVOIR
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

SAN DIEGO MARINE LIFE REFUGE
San Diego Marine Life Refuge, San Diego County.
W81-02800 5C

SAND AQUIFERS
Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

SANDY CREEK QUADRANGLE (NY)
Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

SANTA FE COUNTY
Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

SATELLITE TECHNOLOGY
Transport of Mining Waste in Lake Superior,
W81-02739 5B

SATELLITES (ARTIFICIAL)
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

SCHEDULING
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

SCOTLAND
Organochlorine Compounds in Mussels From Scottish Coastal Waters,
W81-02858 5A

SEA WATER
Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

SEASONAL
Some Ecological Observations on Environmental Parameters, Planktonic Seasonal Succession and Biomass in Rio Cruces (Prov. Valdivia), South Chile,
W81-02876 5C

SEASONAL DISTRIBUTION
A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

SEATTLE
The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

SEAWATER
An Ion-Exchange Technique for Concentrating Ammonia From Small Volumes of Seawater, W81-02823 5A

SEDIMENT DISTRIBUTION
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters, W81-02753 5B

SEDIMENT TRANSPORT
Sediment and Organic Matter Transport in Oregon Coast Range Streams, W81-02652 5B

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979, W81-02704 2J

The Transport of Contaminants in Lake Erie, W81-02744 5B

SEDIMENTS
Pollution of Sea Water and Marine Sediments in Coastal Areas, W81-02808 5B

Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum, W81-02822 2L

The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments, W81-02887 5C

SEMIPERMEABLE MEMBRANES
Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane, W81-02777 5D

SEPARATION TECHNIQUES
Process for Removal of Discrete Particulates and Solutes from Liquids by Foam Flotation, W81-02660 5D

Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies, W81-02848 5A

Simple Method for Concentration of Bacteria From Large Volumes of Tap Water, W81-02853 5A

Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals, W81-02888 5A

SETTLING BASINS
Effects of Coal-Ash Leachate on Ground Water Quality, W81-02785 5B

SEWAGE BACTERIA
Evidence for Cometabolism in Sewage, W81-02849 5B

SEWAGE EFFLUENTS
Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos, W81-02820 5C

SEWAGE SLUDGE
The Statistical Distribution of Sewage and Sludge Analyses, W81-02817 5A

Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils, W81-02830 5E

Modeling Sewage Sludge Decomposition in Soil: 1. Organic Carbon Transformation, W81-02837 5D

Modeling Sewage Sludge Decomposition in Soil: II. Nitrogen Transformations, W81-02838 5E

SEWAGE TREATMENT
Reconstruction of Maldon STW, W81-02899 5D

SHALES
Chemical and Mineralogical Composition and Behavior of the Mancos Shale as a Diffuse Source of Salts in the Upper Colorado River Basin, W81-02711 5B

SHELLFISH
Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries, W81-02847 2L

SIMULATION
Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems, W81-02743 6A

SIMULATION ANALYSIS
Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions, W81-02736 5B

Development of a Groundwater Model for the Henry's Fork and Rigby Fan Areas, Upper Snake River Basin, Idaho, W81-02804 6A

SKINNER LAKE
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources, W81-02751 5C

SLUDGE
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa, W81-02861 5D

SLUDGE DISPOSAL
The Statistical Distribution of Sewage and Sludge Analyses, W81-02817 5A

Atmospheric Emissions of Elements on Particles From the Parkway Sewage-Sludge Incinerator, W81-02855 5E

Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils, W81-02866 5A

SMALL WATERSHEDS
Evaluation of Peak-Flow Data Network of Small Streams in Missouri, W81-02689 2E

SNOW SURVEYS
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data, W81-02869 7B

SNOWMELT
Development of a Streamflow Forecasting Procedure for Intermountain Basins, W81-02726 6A

SOIL AMENDMENTS
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils, W81-02830 5E

SOIL CONSERVATION
Conservation Tillage: Best Management Practice for Nonpoint Runoff, W81-02818 4D

SOIL CONTAMINATION
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils, W81-02653 5B

SOIL ENGINEERING
Relationships Between Basic Soils-Engineering Equations and Basic Ground-Water Flow Equations, W81-02708 2F

SOIL WATER
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report, W81-02782 2G

Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance, W81-02844 5C

SOIL-WATER-PLANT RELATIONSHIPS
Irrigation of Crops in the Southeastern United States, Principles and Practice, W81-02780 3F

SOLAR RADIATION
A Solar Heated Fish Hatchery Water Recycling System, W81-02709 8I

SOUTH AFRICA
Analyses of South African Rainfall, W81-02873 2B

SOUTH CAROLINA
Geochemistry of Fluoride in the Black Creek Aquifer System of Horry and Georgetown Counties, South Carolina--and its Physiological Implications, W81-02677 5G

SOUTHERN LOUISIANA
Water Resources Data for Louisiana, Water Year 1980--Volume 2. Southern Louisiana. W81-02674 7C

SOUTHWEST U.S
Study Plan for the Regional Aquifer-System Analysis of Alluvial Basins in South-Central Arizona and Adjacent States, W81-02701 6A

SOYBEAN WASTES
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa, W81-02861 5D

SPRAY IRRIGATION
Waste Water Spray Transport in Land Application, W81-02722 3F

ST. LAWRENCE RIVER
Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum, W81-02822 2L

ST. LAWRENCE RIVER BASIN
Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins, W81-02675 7C

STANDARD DEVIATION
Flood Frequency Modeling and Outliers, W81-02803 2E

STARCH
Utilization of Low Concentrations of Starch by a Flavobacterium Species Isolated From Tap Water,
W81-02851 5A

STATISTICAL METHODS
Statistics of Receiving Water Response to Runoff,
W81-02766 5C

Flood Frequency Modeling and Outliers,
W81-02803 2E

The Statistical Distribution of Sewage and Sludge Analyses,
W81-02817 5A

STATISTICS
Computer Routines for Probability Distributions, Random Numbers, and Related Functions,
W81-02693 6A

STEADY FLOW
Algorithms for Pipe Network Analysis and Their Reliability,
W81-02658 8C

STORAGE CAPACITY
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

STORM OVERFLOW SEWERS
Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

STORM RUNOFF
Urban Runoff Receiving Water Impacts: Program Overview and Research Needs,
W81-02748 5C

The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

The Ecological Effects of Urban Runoff on Stream Communities,
W81-02754 5C

Dissolved Oxygen Impact from Urban Storm Runoff,
W81-02757 5C

Impacts of Intermittent Urban Discharges on Receiving Waters,
W81-02759 5C

The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

Statistics of Receiving Water Response to Runoff,
W81-02766 5C

Potential of Urban Stormwater Impacts Based on Comparative Analysis of Wet and Dry Weather Pollutant Loads,
W81-02768 5C

Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

STORM SEWERS
Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 5C

Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

STORM WASTE WATER
The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

Continuous Receiving Water Quality Modeling for Urban Stormwater Management,
W81-02767 5C

STORM WASTEWATER
Urban Runoff Receiving Water Impacts: Program Overview and Research Needs,
W81-02748 5C

The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

STORM WATER
The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

STORMWATER RUNOFF
Impacts of Stormwater Runoff on a Florida Lake Ecosystem: Effects on Water Quality and Biota,
W81-02752 5C

STREAM BANKS
Bank Erosion of the Illinois River,
W81-02791 2J

STREAM BIOTA
The Ecological Effects of Urban Runoff on Stream Communities,
W81-02754 5C

Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

STREAM DEGRADATION
Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

STREAM POLLUTION
The Ecological Effects of Urban Runoff on Stream Communities,
W81-02754 5C

STREAMBEDS
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

STREAMFLOW
Streamflow Statistical Summaries for Colorado Streams Through September 30, 1975, Volume 2: Colorado River Basin Above Gunnison River,
W81-02676 7C

Selected Chemical Quality Characteristics in Streams of Kentucky, 1970-75.
W81-02680 2K

Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

STREAMFLOW FORECASTING
Development of a Streamflow Forecasting Procedure for Intermountain Basins,
W81-02726 6A

STREAMS
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

Behavioral and Catastrophic Drift of Invertebrates in Two Streams in Northeastern Wyoming,
W81-02702 2E

Temporal Patterns in Recolonization of Stream Benthos,
W81-02883 5C

SUNSPOTS
Analyses of South African Rainfall,
W81-02873 2B

SURFACE-GROUNDWATER RELATIONSHIPS
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

SURFACE WATER
Water Resources Data for Louisiana, Water Year 1980--Volume 2. Southern Louisiana.
W81-02674 7C

Water Resources Data for Nevada, Water Year 1979.
W81-02698 7C

SURFACE WATERS
Water Resources Data for California, Water Year 1979--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W81-02672 7C

Water Resources Data for California, Water Year 1979--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W81-02673 7C

Water Resources Data for Alabama, Water Year 1979--Volume 1. Apalachicola, Choctawatchee, Blackwater, Escambia, Perdido, and Alabama River Basins.
W81-02706 7C

Water Resources Data for Alabama, Water Year 1979--Volume 2. Tombigbee, Mobile, Dog, Pascagoula, and Tennessee River Basins.
W81-02707 7C

SURVEYS
Aquaculture: Catfish and Trout, Inventory and Sales, 1980.
W81-02776 8I

SUSPENDED SOLIDS
Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

Clay is Mosinee's Choice for Reducing TSS Discharge from Clarifier,
W81-02874 5D

Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals,
W81-02888 5A

Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

SWAMPS
Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

SWEDEN
Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

TANNERY WASTES
Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

TEA LEAF WASTES
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa,
W81-02861 5D

TEMPERATURE CONTROL
Temperature-Controlled Recirculating System for Hatching Catostomid Larvae,
W81-02728 8I

TEMPORAL DISTRIBUTION
Temporal Patterns in Recolonization of Stream Benthos,
W81-02883 5C

TEXAS
Chemical and Physical Characteristics of Water in Estuaries of Texas, October 1974-September 1975,
W81-02684 2L

Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

Survey and Control of Synthetic Organics in Texas Water Supplies,
W81-02719 5A

Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

THERMAL POLLUTION
Non-Radiological Environmental Implications of Nuclear Energy,
W81-02895 5C

THERMAL STRESS
Thermal Tolerance of the Isopod Lirceus Brachyurus (Crustacea:Isopoda),
W81-02810 5C

THERMAL WATER
Non-Radiological Environmental Implications of Nuclear Energy,
W81-02895 5C

THESAURI
Water Resources Thesaurus, Third Edition.
W81-02718 10C

TOXICITY
Mechanisms by Which Acid Precipitation Produces Embryonic Death in Aquatic Vertebrates,
W81-02716 5C

Algal Response to Copper Under Riverine Conditions,
W81-02862 5C

The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

TRACE LEVELS
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

TROUT
The WRRI Trout Cover Rating Method: Development and Application,
W81-02717 8I

Aquaculture: Catfish and Trout, Inventory and Sales, 1980.
W81-02776 8I

TROUT COVER
The WRRI Trout Cover Rating Method: Development and Application,
W81-02717 8I

TROUT HABITAT
The WRRI Trout Cover Rating Method: Development and Application,
W81-02717 8I

TURBIDITY
Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum,
W81-02822 2L

ULTIMATE DISPOSAL
Atmospheric Emissions of Elements on Particles From the Parkway Sewage-Sludge Incinerator,
W81-02855 5E

UNITED STATES GEOLOGICAL SURVEY
USGS: Its Water Resources Research Activity,
W81-02839 9C

URBAN RUNOFF
The Distribution, Transport and Cycling of Dissolved and Particulate Organic Carbon in the Potomac and Anacostia Rivers in the Greater Washington Area,
W81-02656 5B

Urban Runoff Receiving Water Impacts: Program Overview and Research Needs,
W81-02748 5C

An Approach for Assessing the Water Quality Significance of Chemical Contaminants in Urban Lakes,
W81-02749 5C

The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

The Ecological Effects of Urban Runoff on Stream Communities,
W81-02754 5C

Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

Dissolved Oxygen Impact from Urban Storm Runoff,
W81-02757 5C

Impacts of Intermittent Urban Discharges on Receiving Waters,
W81-02759 5C

Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

Continuous Receiving Water Quality Modeling for Urban Stormwater Management,
W81-02767 5C

Potential of Urban Stormwater Impacts Based on Comparative Analysis of Wet and Dry Weather Pollutant Loads,
W81-02768 5C

The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

A Water Quality Planning Methodology for Urban Areas,
W81-02771 6B

UTAH
Hydrologic and Climatologic Data, Southeastern Uinta Basin, Utah, and Colorado, Water Year 1978,
W81-02694 7C

VIRGINIA
Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

VISTULA RIVER
Poland Launches Major Program to Restore and Regulate Country's Largest River System,
W81-02889 5D

VOLGA RIVER (USSR)
The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

WALES
Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

WASHINGTON
The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water,
W81-02831 6C

WASTE DISPOSAL
Waste Discharge Requirements for Nonsewerable Waste Disposal to Land,
W81-02798 5C

WASTE DUMPS
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

Waste Discharge Requirements for Nonsewerable Waste Disposal to Land,
W81-02798 5C

WASTE RECOVERY
Caprolactam Recovery from Aqueous Manufacturing Streams,
W81-02783 5D

WASTE TREATMENT
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

WASTE WATER ANALYSIS
GC/MS Methodology for Measuring Priority Organics in Municipal Waste Water Treatment,
W81-02784 5A

WASTE WATER DISPOSAL
Waste Water Spray Transport in Land Application,
W81-02722 3F

WASTE WATER FACILITIES
The Effect of Heavy Metals on the Performance of Rotating Biological Contactors (RBC),
W81-02723 5D

The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

WASTE WATER IRRIGATION
Waste Water Spray Transport in Land Application,
W81-02722 3F

WASTE WATER OUTFALL
Julia Pfeiffer Burns Underwater Park, Monterey County.
W81-02801 5C

WASTE WATER (POLLUTION)
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

WASTE WATER RECLAMATION
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

WASTE WATER TREATMENT
Process for Removal of Discrete Particulates and Solutes from Liquids by Foam Flotation,
W81-02660 5D

Continuous Receiving Water Quality Modeling for Urban Stormwater Management,
W81-02767 5C

Hoover Dam Advanced Waste Treatment System; Volume I, Pilot Studies Report.
W81-02772 5D

Hoover Dam Advanced Waste Treatment System: Volume II, Pilot Studies Summary Data.
W81-02773 5D

Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

Caprolactam Recovery from Aqueous Manufacturing Streams,
W81-02783 5D

The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

Multi Stage Flocculation Treatment System,
W81-02805 5D

Clay is Mosinee's Choice for Reducing TSS Discharge from Clarifier,
W81-02874 5D

Industrial Wastewater Vs. the POTW,
W81-02884 5D

WASTEWATER DISPOSAL
Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

WASTEWATER LAGOONS
Groundwater Contamination Potential at 21 Industrial Waste-Water Impoundments in Ohio,
W81-02841 5B

Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

WATER ANALYSIS
Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

Physical, Chemical, and Biological Characteristics of Lake Ellyn Sediments.
W81-02793 2H

Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

WATER CHEMISTRY
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

WATER CIRCULATION
Modeling the Great Lakes - A History of Achievement,
W81-02731 7A

Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

A Multi-Layered Nested Grid Model of Lake Superior,
W81-02741 2H

The Transport of Contaminants in Lake Erie,
W81-02744 5B

WATER CURRENTS
A Two-Mode Free-Surface Numerical Model for the Three-Dimensional Time-Dependent Currents in Large Lakes,
W81-02778 2H

WATER DEMAND
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

Appraisal of Ground-Water Resouces in the San Antonio Creek Valley, Santa Barbara County, California,
W81-02700 6D

WATER DISTRIBUTION
Algorithms for Pipe Network Analysis and Their Reliability,
W81-02658 8C

WATER LAW
Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

WATER LEVELS
Selected Water-Level Records for Oklahoma, 1979-80,
W81-02683 2F

Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

WATER MANAGEMENT
The Politics of Water Pollution Control: A Case Study of the Formation of the Canada Water Act, Part I: Comprehensive Water Resource Management: Part II: Nutrient Control,
W81-02836 6E

WATER MANAGEMENT (APPLIED)
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

WATER POLICY
Public Attitudes of Nebraskans Toward Water Policy,
W81-02725 6E

The Politics of Water Pollution Control: A Case Study of the Formation of the Canada Water Act, Part I: Comprehensive Water Resource Management: Part II: Nutrient Control,
W81-02836 6E

WATER POLLUTION
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

The Transport of Contaminants in Lake Erie,
W81-02744 5B

Self-Organization of Three-Dimensional Models of Water Pollution,
W81-02745 5B

The Impact of Combined Sewer Overflows on the Dissolved Oxygen Concentration of a Small Stream,
W81-02758 5C

Impacts of Intermittent Urban Discharges on Receiving Waters,
W81-02759 5C

The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

Statistics of Receiving Water Response to Runoff,
W81-02766 5C

Continuous Receiving Water Quality Modeling for Urban Stormwater Management,
W81-02767 5C

Potential of Urban Stormwater Impacts Based on Comparative Analysis of Wet and Dry Weather Pollutant Loads,
W81-02768 5C

The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

WATER POLLUTION CONTROL

Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

Phosphate Removal with Calcium Carbonate Precipitation in the Lake of Constance (Obersee). (Phosphatelimination Durch Autochthone Calcitfallung Im Bodensee-Obersee),
W81-02882 5D

Poland Launches Major Program to Restore and Regulate Country's Largest River System,
W81-02889 5D

WATER POLLUTION EFFECTS

Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

Effects of Fly Ash Heavy Metals on Daphnia Magna,
W81-02715 5B

Measurement of Physiological Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

Sediment Characteristics of Eleocharis Acicularis (L.) R. S. Sites in Streams and Lakes of Central Pennsylvania,
W81-02821 5C

Coal-Liquefaction Products, Shale Oil, and Petroleum. Acute Toxicity to Freshwater Algae,
W81-02854 5C

Use of Synthetic Detergents in Malaysia,
W81-02896 5C

WATER POLLUTION SOURCES

Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California,
W81-02690 5B

Optimal Sampling for Long Term Trends in Lake Huron,
W81-02733 7B

A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

WATER POLLUTION TREATMENT

Process for Removal of Discrete Particulates and Solutes from Liquids by Foam Flotation,
W81-02660 5D

WATER PURIFICATION

The Effect of pH on the Coagulation and Purification of Wastewater,
W81-02832 5D

Franklaw Water Treatment Works.
W81-02898 5F

WATER QUALITY

Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

Water Resources Data for California, Water Year 1979--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W81-02672 7C

Water Resources Data for California, Water Year 1979--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W81-02673 7C

Water Resources Data for Louisiana, Water Year 1980--Volume 2. Southern Louisiana.
W81-02674 7C

Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

Geochemistry of Fluoride in the Black Creek Aquifer System of Horry and Georgetown Counties, South Carolina--and its Physiological Implications,
W81-02677 5G

Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

Selected Chemical Quality Characteristics in Streams of Kentucky, 1970-75.
W81-02680 2K

Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

Chemical and Physical Characteristics of Water in Estuaries of Texas, October 1974-September 1975,
W81-02684 2L

A Water-Quality Monitoring Network for Vallecitos Valley, Alameda County, California,
W81-02685 5B

Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

Water Resources Data for Nevada, Water Year 1979.
W81-02698 7C

Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

Water Resources Data for Alabama, Water Year 1979--Volume 1. Apalachicola, Choctawatchee, Blackwater, Escambia, Perdido, and Alabama River Basins.
W81-02706 7C

Water Resources Data for Alabama, Water Year 1979--Volume 2. Tombigbee, Mobile, Dog, Pascagoula, and Tennessee River Basins.
W81-02707 7C

Water Quality of a Reservoir Used for Reclaimed Water Storage,
W81-02712 5G

Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

Modeling the Great Lakes - A History of Achievement,
W81-02731 7A

Data Management Requirements for Great Lakes Water Quality Modeling,
W81-02732 7C

Principle of Organization of an Automated Information System,
W81-02740 7C

Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

WATER QUALITY CONTROL

Survey and Control of Synthetic Organics in Texas Water Supplies,
W81-02719 5A

The Effect of Heavy Metals on the Performance of Rotating Biological Contactors (RBC),
W81-02723 5D

Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

WATER QUALITY MANAGEMENT

A Water Quality Planning Methodology for Urban Areas,
W81-02771 6B

WATER QUALITY STANDARDS

Dissolved Oxygen Impact from Urban Storm Runoff,
W81-02757 5C

WATER RATES

The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water,
W81-02831 6C

WATER RECLAMATION

Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

WATER RESOURCES

Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

Water Resources Thesaurus, Third Edition.
W81-02718 10C

USGS: Its Water Resources Research Activity,
W81-02839 9C

WATER RESOURCES DEVELOPMENT

Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems,
W81-02743 6A

Poland Launches Major Program to Restore and Regulate Country's Largest River System,
W81-02889 5D

WATER REUSE

Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

A Solar Heated Fish Hatchery Water Recycling System,
W81-02709 8I

WATER REUSE

Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

WATER RIGHTS

California's Water Conflict: North vs South,
W81-02809 6E

WATER SUPPLY

Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

WATER SUPPLY DEVELOPMENT

Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

WATER TABLE FLUCTUATIONS

Development of a Groundwater Model for the Henry's Fork and Rigby Fan Areas, Upper Snake River Basin, Idaho,
W81-02804 6A

WATER TREATMENT

Survey and Control of Synthetic Organics in Texas Water Supplies,
W81-02719 5A

Franklaw Water Treatment Works.
W81-02898 5F

WATER USE

Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

WATER UTILIZATION

Appraisal of Ground-Water Resouces in the San Antonio Creek Valley, Santa Barbara County, California,
W81-02700 6D

WATER WELLS

Selected Water-Level Records for Oklahoma, 1979-80,
W81-02683 2F

WATER YIELD

Appraisal of Ground-Water Resouces in the San Antonio Creek Valley, Santa Barbara County, California,
W81-02700 6D

WELL DATA

Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

WIND ENERGY

Application of Wind Energy to Great Plains Irrigation Pumping,
W81-02781 8C

WORTH CENTER QUADRANGLE (NY)

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

WYOMING

Behavioral and Catastrophic Drift of Invertebrates in Two Streams in Northeastern Wyoming,
W81-02702 2E

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

YEASTS

Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

ZINC CYANIDE

Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

AUTHOR INDEX

ADAMS, J. R.
Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

ADEMOROTI, C. M. A.
The Effect of pH on the Coagulation and Purification of Wastewater,
W81-02832 5D

ALBRIGHT, L. J.
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

ALEXANDER, M.
Biodegradation of Chemicals of Environmental Concern,
W81-02871 5B

Evidence for Cometabolism in Sewage,
W81-02849 5B

ALLAN, R. J.
The Inadequacy of Existing Chlorophyll-a/Phosphorus Concentration Correlations for Assessing Remedial Measures for Hypertrophic Lakes,
W81-02856 5C

ALLISON, L. J.
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

ALLRED, E. R.
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

AMMON, D.
Potential of Urban Stormwater Impacts Based on Comparative Analysis of Wet and Dry Weather Pollutant Loads,
W81-02768 5C

ANDERSON, T. W.
Study Plan for the Regional Aquifer-System Analysis of Alluvial Basins in South-Central Arizona and Adjacent States,
W81-02701 6A

ANDREWS, D.
Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

ARMSTRONG, J. W.
Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

ASHCHEPKOVA, L. Y.
A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

ATLAS, E.
Global Transport of Organic Pollutants: Ambient Concentrations in the Remote Marine Atmosphere,
W81-02872 5B

BACHE, C. A.
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

BARBOSA, F. A. R.
Primary Production of Phytoplankton and Environmental Characteristics of a Shallow Quaternary Lake at Eastern Brazil,
W81-02878 5C

BARKS, J. H.
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

BATCHELOR, B.
Survey and Control of Synthetic Organics in Texas Water Supplies,
W81-02719 5A

BATTERSON, T. R.
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

BEBEE, B. N.
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

BECKETT, P. H. T.
The Statistical Distribution of Sewage and Sludge Analyses,
W81-02817 5A

BENNETT, C. R.
Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

BERKAS, W. R.
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

BERNE, S.
Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

BERTENSHAW, M. P.
Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation,
W81-02811 5A

BESCHTA, R. L.
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

BETHOUX, J. P.
Phosphorus and Nitrogen in the Mediterranean Sea: Budgets and Potential Fertility. (Le Phosphore et L'Azote En Mer Mediterranee, Bilans et Fertilite Potentielle),
W81-02891 5B

BHOSLE, N. B.
Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

BHOWMIK, N. G.
Bank Erosion of the Illinois River,
W81-02791 2J

BIERMAN, V. J. JR.
A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

BIGGAR, J. W.
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

BINETTI, V. P.
Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

BISEL, G. JR.
Brine Pollution at Fresno - Twenty-Six Years Later,
W81-02843 5B

BISHOP, C. S.
Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

BISHOP, D. F.
GC/MS Methodology for Measuring Priority Organics in Municipal Waste Water Treatment,
W81-02784 5A

BISWAS, A. K.
Non-Radiological Environmental Implications of Nuclear Energy,
W81-02895 5C

BITTON, G.
Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

BLANCHER, E. C. II.
Impacts of Stormwater Runoff on a Florida Lake Ecosystem: Effects on Water Quality and Biota,
W81-02752 5C

BORNHOP, D.
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

BOTELLO, A. V.
Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

BOTSENYUK, K. I.
The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

BOTT, T. L.
Fungal Pathogen of Cladophora Glomerata (Chlorophyta),
W81-02846 5G

BOYDEN, C. R.
The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

BOZEMAN, M.
Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

BRADSHAW, A. S.
The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

BRAMER, H. C.
The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

BREESE, J.
The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water,
W81-02831 6C

BREWER, W. S.
Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils,
W81-02866 5A

BROWN, E. R.
Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

BRUCE, R. R.
Irrigation of Crops in the Southeastern United States, Principles and Practice,
W81-02780 3F

BURESH, R. J.
Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

BURNETT, W. C.
The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

BYRNE, C.
The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

BYRON, J. C.
Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

CADOTTE, J. E.
Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

CANALE, R. P.
The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

CARBONELL, N.
Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

CASWELL, C. A.
The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

CHAMP, M. A.
The Distribution, Transport and Cycling of Dissolved and Particulate Organic Carbon in the Potomac and Anacostia Rivers in the Greater Washington Area,
W81-02656 5B

CHANG, A.
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

CHANG, A. T. C.
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

CHANG, L. T.
Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

CHAUDRY, M. M.
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

CHEPER, N. J.
Thermal Tolerance of the Isopod Lirceus Brachyurus (Crustacea:Isopoda),
W81-02810 5C

CHERKAUER, D. S.
Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

CHESNESS, J. L.
Irrigation of Crops in the Southeastern United States, Principles and Practice,
W81-02780 3F

CHEW, K. K.
Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

CIRELLO, J.
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

CLIFFORD, K.
Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

COLEMAN, G. C.
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

COLWELL, R. R.
Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

CONROY, L. S.
Hydrologic and Climatologic Data, Southeastern Uinta Basin, Utah, and Colorado, Water Year 1978,
W81-02694 7C

COOPER, D. J.
Reconstruction of Maldon STW,
W81-02899 5D

COPELAND, J. D.
Industrial Wastewater Vs. the POTW,
W81-02884 5D

COUILLARD, D.
Environmental Impact of Kraft Plant Effluents on Salmo Salar Ouananiche Analyzed by a New Method, the Coherence Graph. (Evaluation des Impacts Environnementaux Dus Au Rejets D'Une Usine de Pate Kraft Sur Le Salmo Salar Ouananiche A L'Aide D'Une Nouvelle Methode: Le Graphe de Coherence),
W81-02867 5C

COULTER, G. J.
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

COWAN, A. A.
Organochlorine Compounds in Mussels From Scottish Coastal Waters,
W81-02858 5A

CRERAR, D. A.
Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,
W81-02868 5B

CROMACK, K. JR.
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

CUNNINGHAM, A. B.
Development of a Streamflow Forecasting Procedure for Intermountain Basins,
W81-02726 6A

CURRY, K. D.
Temperature-Controlled Recirculating System for Hatching Catostomid Larvae,
W81-02728 8I

D'OZOUVILLE, L.
Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

DANIEL, T. C.
Conservation Tillage: Best Management Practice for Nonpoint Runoff,
W81-02818 4D

DEBO, T. N.
Estimating Flood Damages in the State of Georgia,
W81-02720 6F

DEHKORDI, F. G.
The Effect of Heavy Metals on the Performance of Rotating Biological Contactors (RBC),
W81-02723 5D

DELAUNE, R. D.
Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

DENNY, P.
The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

DI TORO, D. M.
Species Dependent Mass Transport and Chemical Equilibria: Application to Chesapeake Bay Sediments,
W81-02735 2K

DIBBLE, J. H.
Caprolactam Recovery from Aqueous Manufacturing Streams,
W81-02783 5D

DITORO, D. M.
Statistics of Receiving Water Response to Runoff,
W81-02766 5C

DIXON, P. S.
Water Quality of a Reservoir Used for Reclaimed Water Storage,
W81-02712 5G

DODGE, K. A.
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

DODSON, J.
Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

DOLAN, D. M.
Optimal Sampling for Long Term Trends in Lake Huron,
W81-02733 7B

A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

DOMBROVSKIY, Y. A.
A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

DONAHUE, C. R.
The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

DOUGLAS, L. A.
Modeling Sewage Sludge Decomposition in Soil: II. Nitrogen Transformations,
W81-02838 5E

Modeling Sewage Sludge Decomposition in Soil: 1. Organic Carbon Transformation,
W81-02837 5D

DOUGLASS, J. E.
Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future,
W81-02729 9C

DRAPER, A. C. III
Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils,
W81-02866 5A

DURRSCHMIDT, M.
Some Ecological Observations on Environmental Parameters, Planktonic Seasonal Succession and Biomass in Rio Cruces (Prov. Valdivia), South Chile,
W81-02876 5C

EDWARDS, M. D.
Directory of Assistance Centers of the National Water Data Exchange (NAWDEX),
W81-02681 10D

EDWARDS, R. E.
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

ELDER, M. D.
Reconstruction of Maldon STW,
W81-02899 5D

ELFVING, D. C.
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

ELLIS, D.
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

ELLIS, F. W.
A Water Quality Planning Methodology for Urban Areas,
W81-02771 6B

EMMETT, W. W.
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

EPSHTEYN, L. V.
Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems,
W81-02743 6A

ETCHEBER, H.
Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals,
W81-02888 5A

EVANCE, J. G.
Reconstruction of Maldon STW,
W81-02899 5D

EVANGELOU, V. P.
Chemical and Mineralogical Composition and Behavior of the Mancos Shale as a Diffuse Source of Salts in the Upper Colorado River Basin,
W81-02711 5B

EVANS, R. L.
Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

EVANS, T. M.
Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies,
W81-02848 5A

FALKLER, W. A. JR.
Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

FARRAH, S. R.
Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

FARRAR, C. D.
A Water-Quality Monitoring Network for Vallecitos Valley, Alameda County, California,
W81-02685 5B

FELDMAN, S. L.
The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water,
W81-02831 6C

FIELD, R.
Potential of Urban Stormwater Impacts Based on Comparative Analysis of Wet and Dry Weather Pollutant Loads,
W81-02768 5C

Urban Runoff Receiving Water Impacts: Program Overview and Research Needs,
W81-02748 5C

FINCK, R.
Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

FISZMAN, M.
Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

FOK, Y-S.
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

FONG, R. H. L.
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

FORTE, J. L.
The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

FOSTER, J. L.
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

FOX, K. P.
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

FRANKS, A. L.
Waste Discharge Requirements for Nonsewerable Waste Disposal to Land,
W81-02798 5C

FREEDMAN, S. D.
Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

FURR, A. K.
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

GALE, R.
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

GALLOWAY, W.
Measurement of Physiological Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

GAVRILOV, I. T.
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

GEISER, K. M.
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

GELSTHORPE, D.
Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation,
W81-02811 5A

GERBA, C. P.
Simple Method for Concentration of Bacteria From Large Volumes of Tap Water,
W81-02853 5A

GIAM, C. S.
Global Transport of Organic Pollutants: Ambient Concentrations in the Remote Marine Atmosphere,
W81-02872 5B

GIBSON, R.
The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments,
W81-02887 5C

GIDDINGS, J. M.
Coal-Liquefaction Products, Shale Oil, and Petroleum. Acute Toxicity to Freshwater Algae,
W81-02854 5C

GILLESPIE, D. P.
Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

GLANDON, R. P.
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

GLASS, G. E.
Transport of Mining Waste in Lake Superior,
W81-02739 5B

GOBEIL, C.
Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum,
W81-02822 2L

GOLDSCHMIDT, Y.
The Long Run Profitability of Western Irrigated Agriculture: An In-Depth Analysis,
W81-02655 6C

GOLDSMITH, R. L.
Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

GORDON, G. E.
Atmospheric Emissions of Elements on Particles From the Parkway Sewage-Sludge Incinerator,
W81-02855 5E

GORDON, R. W.
Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

GORSTKO, A. B.
Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems,
W81-02743 6A

A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

GOSS, R. L.
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

GOYAL, S. M.
Simple Method for Concentration of Bacteria From Large Volumes of Tap Water,
W81-02853 5A

GRANT, D. C.
Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

GREEN, R. S.
Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

GREENBERG, R. R.
Atmospheric Emissions of Elements on Particles From the Parkway Sewage-Sludge Incinerator,
W81-02855 5E

GREGORY, R. W.
Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

GUTENMANN, W. H.
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

HADA, H. S.
Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

HAGEN, L. J.
Application of Wind Energy to Great Plains Irrigation Pumping,
W81-02781 8C

HAGLER, A. N.
Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

HAJEK, B. K.
Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

HALL, D. K.
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

HALTERMAN, S. G.
Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

HAMA, T.
Molecular Weight Distribution and Characterization of Dissolved Organic Matter From Lake Waters,
W81-02877 2H

HANDA, N.
Molecular Weight Distribution and Characterization of Dissolved Organic Matter From Lake Waters,
W81-02877 2H

HARE, H. E.
Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

HARENBERG, W. A.
Using Channel Geometry to Estimate Flood Flows at Ungaged Sites in Idaho,
W81-02679 6A

HARLAND, J. R.
Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

HARPER, H. H. III
Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

HARR, R. D.
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

HARSH, J. F.
Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

HARVEY, H. H.
Growth Responses of Yellow Perch, Perca Flavescens (Mitchill), to Lake Acidification in the La Cloche Mountain Lakes of Ontario,
W81-02833 5C

HAUTH, L. D.
Evaluation of Peak-Flow Data Network of Small Streams in Missouri,
W81-02689 2E

HAYES, W. B.
Affinity Tests for the Detection of Community Alteration in Plankton: Evaluation With a Distributional Computer Model,
W81-02860 5C

HEANEY, J. P.
Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

HEIDTKE, T. M.
Modeling the Great Lakes - A History of Achievement,
W81-02731 7A

HEIMES, F. J.
Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

HICKMAN, M.
Phosphorus, Chlorophyll, and Eutrophic Lakes,
W81-02886 5C

HIJNEN, W. A. M.
Utilization of Low Concentrations of Starch by a Flavobacterium Species Isolated From Tap Water,
W81-02851 5A

HOEFFNER, S.
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

HOGE, J. H.
Process for Removal of Discrete Particulates and Solutes from Liquids by Foam Flotation,
W81-02660 5D

HOLMBOM, B. R.
Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents,
W81-02875 5A

HORNUNG, H.
Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

HSIEH, Y. P.
Modeling Sewage Sludge Decomposition in Soil: II. Nitrogen Transformations,
W81-02838 5E

Modeling Sewage Sludge Decomposition in Soil: 1. Organic Carbon Transformation,
W81-02837 5D

HUANG, J-C.
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

HUBBARD, J. H.
Process for Removal of Discrete Particulates and Solutes from Liquids by Foam Flotation,
W81-02660 5D

HUBER, W. C.
Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

HUNG, J.
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

HUNTER, J. R.
Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

HUNTER, J. V.
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

HUSSONG, D.
Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

HUTCHINSON, C. B.
Appraisal of Ground-Water Resouces in the San Antonio Creek Valley, Santa Barbara County, California,
W81-02700 6D

HVITVED-JACOBSEN, T.
The Impact of Combined Sewer Overflows on the Dissolved Oxygen Concentration of a Small Stream,
W81-02758 5C

INOKO, M.
Studies on the Photochemical Decomposition of Organomercurials--Methylmercury(II) Chloride,
W81-02816 5B

IRSHAD, M.
Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

ISHIDA, Y.
Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

IVAKHNENKO, A. G.
Self-Organization of Three-Dimensional Models of Water Pollution,
W81-02745 5B

JACKSON, T. J.
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

JACOBS, R. R.
Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

JACOBSON, S. N.
Evidence for Cometabolism in Sewage,
W81-02849 5B

JAMES, C. J.
The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments,
W81-02887 5C

JENKINS, T. F.
Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

JONES, R. A.
An Approach for Assessing the Water Quality Significance of Chemical Contaminants in Urban Lakes,
W81-02749 5C

JORDAN, R. J.
Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

JORGENSEN, D. G.
Relationships Between Basic Soils-Engineering Equations and Basic Ground-Water Flow Equations,
W81-02708 2F

JOUANNEAU, J. M.
Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals,
W81-02888 5A

JUTTNER, F.
Detection of Lipid Degradation Products in the Water of a Reservoir During a Bloom of Synura Uvella,
W81-02850 5A

KADOTA, H.
Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

KARANIK, J. M.
Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

KARAUSHEV, A. V.
Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions,
W81-02736 5B

KAYFETZ, V.
California's Water Conflict: North vs South,
W81-02809 6E

KEAN, W. F.
Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

KEEFER, T. N.
Dissolved Oxygen Impact from Urban Storm Runoff,
W81-02757 5C

KEISLING, T. C.
Irrigation of Crops in the Southeastern United States, Principles and Practice,
W81-02780 3F

KELLY, G. M.
Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

KIM, K. W.
Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

KING, R. S.
Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

KIRBY, W.
Computer Routines for Probability Distributions, Random Numbers, and Related Functions,
W81-02693 6A

KLEIN, H.
Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

KLOTZ, R. L.
Algal Response to Copper Under Riverine Conditions,
W81-02862 5C

KNOOP, K. D.
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

KOESTER, H. E.
Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

KOZHOVA, O. M.
A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

KRANCHER, J. A.
Brine Pollution at Fresno - Twenty-Six Years Later,
W81-02843 5B

KREFT, P. H.
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

KROH, G. C.
Sediment Characteristics of Eleocharis Acicularis (L.) R. S. Sites in Streams and Lakes of Central Pennsylvania,
W81-02821 5C

KROTOV, G. I.
Self-Organization of Three-Dimensional Models of Water Pollution,
W81-02745 5B

KROTOVA, V. A.
A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

KUCAK, T.
Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,
W81-02868 5B

LASSA, J. M.
Clay is Mosinee's Choice for Reducing TSS Discharge from Clarifier,
W81-02874 5D

LAY, C. C.
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa,
W81-02861 5D

LAZOFF, S.
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

LECHEVALLIER, M. W.
Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies,
W81-02848 5A

LEE, G. F.
An Approach for Assessing the Water Quality Significance of Chemical Contaminants in Urban Lakes,
W81-02749 5C

LEGGETT, D. C.
Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

LEHMAN, M. E.
Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

LEVINGS, G. W.
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

LICK, W.
The Transport of Contaminants in Lake Erie,
W81-02744 5B

A Two-Mode Free-Surface Numerical Model for the Three-Dimensional Time-Dependent Currents in Large Lakes,
W81-02778 2H

LIN, S. D.
Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

LIND, W. B.
Chemical and Physical Characteristics of Water in Estuaries of Texas, October 1974-September 1975,
W81-02684 2L

LINDSEY, G.
Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

Phase II Report - Preliminary Investigation of Small-Scale Hydropower Potential at Five Sites in Illinois,
W81-02790 6B

Small Scale Hydropower Development in Illinois: An Implementation Manual,
W81-02788 6B

LIU, C. S.
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

LO, A.
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

LUCKEY, R. R.
Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

LYLES, L.
Application of Wind Energy to Great Plains Irrigation Pumping,
W81-02781 8C

MACARTHUR, D. A.
The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

MACKO, S. A.
Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

MANAHAN, S. E.
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

MANCINI, J. L.
Impacts of Intermittent Urban Discharges on Receiving Waters,
W81-02759 5C

MANDT, M. G.
Multi Stage Flocculation Treatment System,
W81-02805 5D

MARCHAND, M.
Pollution of Sea Water and Marine Sediments in Coastal Areas,
W81-02808 5B

MARTEL, C. J.
Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

MARTIN, W. E.
The Long Run Profitability of Western Irrigated Agriculture: An In-Depth Analysis,
W81-02655 6C

MATTSSON, S.
Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

MATVEYEV, A. A.
Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems,
W81-02743 6A

Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

MAVINKURVE, S.
Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

MCCORISON, F. M.
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

MCNABB, C. D.
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

MCNULTY, K. J.
Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

MCQUIVEY, R. S.
Dissolved Oxygen Impact from Urban Storm Runoff,
W81-02757 5C

MEADE, R. H.
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

MEANS, J. C.
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

MEANS, J. L.
Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications,
W81-02868 5B

MEDINA, M. A. JR.
Continuous Receiving Water Quality Modeling for Urban Stormwater Management,
W81-02767 5C

MEINHOLZ, T. L.
Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 5C

MELNIKO, Y. V.
The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

MENDONCA-HAGLER, L. C.
Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

MENSHUTKIN, V. V.
A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

MESSENGER, A. L.
Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

MEYER, W.
Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

MILLER, D. R.
Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

MILLER, R. J.
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

MILLER, S.
USGS: Its Water Resources Research Activity,
W81-02839 9C

MILLER, T. S.
Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

Surficial Geology of Redfield Quadrangle, Oswego County, New York,
W81-02664 7C

MILLIGAN, J. D.
Effects of Coal-Ash Leachate on Ground Water Quality,
W81-02785 5B

MILLS, G. L.
Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography,
W81-02824 5A

MILLS, W. B.
Selected Water-Level Records for Oklahoma, 1979-80,
W81-02683 2F

MIX, M. C.
An Ion-Exchange Technique for Concentrating Ammonia From Small Volumes of Seawater,
W81-02823 5A

MOFFA, P. E.
Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

MORIN, R.
Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

MORTIMER, R. D.
Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents,
W81-02875 5A

MOTTO, H. L.
Modeling Sewage Sludge Decomposition in Soil: II. Nitrogen Transformations,
W81-02838 5E

Modeling Sewage Sludge Decomposition in Soil: 1. Organic Carbon Transformation,
W81-02837 5D

MOURANT, W. A.
Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

MUELLER, D. H.
Conservation Tillage: Best Management Practice for Nonpoint Runoff,
W81-02818 4D

MUIR, K. S.
Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California,
W81-02690 5B

MULLER, E. H.
Surficial Geology of Central Square Quadrangle, Oswego County, New York,
W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York,
W81-02671 7C

Surficial Geology of New Haven Quadrangle, Oswego County, New York,
W81-02661 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York,
W81-02669 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York,
W81-02663 7C

MURABAYASHI, E. T.
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

MURPHY, C. B. JR.
The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

MURPHY, L. S.
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

MYRICK, R. M.
Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

NAKAJI, M.
Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

NEARY, D. G.
Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future,
W81-02729 9C

NIELSEN, D. R.
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

NIKANOROV, A. M.
A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

NILSSON, M.
Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

NOYES, J. A.
Groundwater Contamination Potential at 21 Industrial Waste-Water Impoundments in Ohio,
W81-02841 5B

O'LEARY, S. J.
Sediment and Organic Matter Transport in Oregon Coast Range Streams,
W81-02652 5B

O'MARA, N. L.
Evidence for Cometabolism in Sewage,
W81-02849 5B

OBEITER, R.
The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water,
W81-02831 6C

OKUBADEJO, A. O.
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

OLSON, B. H.
Scanning Electron Microscope Evidence for Bacterial Colonization of a Drinking-Water Distribution System,
W81-02812 5A

OLSON, R. V.
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

OLUWANDE, P. A.
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

OMAN, G. J.
A Multi-Layered Nested Grid Model of Lake Superior,
W81-02741 2H

OREN, O. H.
Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

OTT, R.
Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York,
W81-02770 5C

PADGETT, D. E.
Vegetative Propagation of Some Saprolegniaceae Under Simulated-Estuarine-Culture Conditions,
W81-02814 2L

PALLAS, J. E. JR.
Irrigation of Crops in the Southeastern United States, Principles and Practice,
W81-02780 3F

PANKHURST, N. W.
The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

PANT, M. C.
Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

PARKER, P. L.
Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

PARKHURST, B. R.
The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

PARKINSON, T. F.
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

PARLOUR, J. W.
The Politics of Water Pollution Control: A Case Study of the Formation of the Canada Water Act, Part I: Comprehensive Water Resource Management: Part II: Nutrient Control,
W81-02836 6E

PARSONS, T. R.
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

PATRICK, L.
Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

PATRICK, R.
Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

PATRICK, W. H. JR.
Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

PATTERSON, R. L.
A Review of Some Methods and Parameters Used in Assessing Effects of Water Intakes on Fish Populations,
W81-02742 5C

PAUL, J. F.
Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

PAVELKO, V. L.
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

Principle of Organization of an Automated Information System,
W81-02740 7C

The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

PAYNE, F. C.
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

PENKAL, R. F.
Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

PERKINS, E. G.
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

PERRY, C. A.
Preliminary Analysis of Regional-Precipitation Periodicity,
W81-02687 2B

PETERSEN, R. J.
Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

PETERSON, D. A.
Behavioral and Catastrophic Drift of Invertebrates in Two Streams in Northeastern Wyoming,
W81-02702 2E

PETSCH, H. E. JR.
Streamflow Statistical Summaries for Colorado Streams Through September 30, 1975, Volume 2: Colorado River Basin Above Gunnison River,
W81-02676 7C

PETTS, G. E.
Long-Term Consequences of Upstream Impoundment,
W81-02835 6G

PETTY, J. D.
Chromatographic Enrichment of Acidic Compounds From Organic Solvents Using Alkali Metal Silicates,
W81-02829 5A

PFEIFFER, W. C.
Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

PHELPS, D. K.
Measurement of Physiological Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

PITT, R.
Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

PORCELLA, D. B.
The Ecological Effects of Urban Runoff on Stream Communities,
W81-02754 5C

POUGH, F. H.
Mechanisms by Which Acid Precipitation Produces Embryonic Death in Aquatic Vertebrates,
W81-02716 5C

POWER, G.
Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

POWERS, W. L.
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

PRUDIC, D. E.
Permeability of Covers Over Low-Level Radioactive-Waste Burial Trenches, West Valley, Cattaraugus County, New York,
W81-02692 5E

PRUISKMA, R. T.
Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

PUDLIS, E.
Poland Launches Major Program to Restore and Regulate Country's Largest River System,
W81-02889 5D

QUDDUS, M. A.
Use of Synthetic Detergents in Malaysia,
W81-02896 5C

QUINN, J. G.
Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography,
W81-02824 5A

RANGO, A.
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

RATHBUN, I. G.
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

RAWSON, J.
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

REYNOLDS, T. D.
Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

RICHARDSON, C.
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

RICHARDSON, W. L.
Data Management Requirements for Great Lakes Water Quality Modeling,
W81-02732 7C

RIDGWAY, H. F.
Scanning Electron Microscope Evidence for Bacterial Colonization of a Drinking-Water Distribution System,
W81-02812 5A

RILEY, R. T.
An Ion-Exchange Technique for Concentrating Ammonia From Small Volumes of Seawater,
W81-02823 5A

ROGENMUSER, K.
Fungal Pathogen of Cladophora Glomerata (Chlorophyta),
W81-02846 5G

ROMANOVSKIY, V. V.
Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions,
W81-02736 5B

ROSSKNECHT, H.
Phosphate Removal with Calcium Carbonate Precipitation in the Lake of Constance (Obersee). (Phosphatelimination Durch Autochthone Calcitfallung Im Bodensee-Obersee),
W81-02882 5D

RUANE, R. J.
Effects of Coal-Ash Leachate on Ground Water Quality,
W81-02785 5B

RUBISON, R. M.
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

RYAN, P. M.
Growth Responses of Yellow Perch, Perca Flavescens (Mitchill), to Lake Acidification in the La Cloche Mountain Lakes of Ontario,
W81-02833 5C

SAWYER, E. S.
A Solar Heated Fish Hatchery Water Recycling System,
W81-02709 8I

SAWYER, P. J.
A Solar Heated Fish Hatchery Water Recycling System,
W81-02709 8I

SCHAUF, F. J.
Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

SCHEIN, R. D.
Sediment Characteristics of Eleocharis Acicularis (L.) R. S. Sites in Streams and Lakes of Central Pennsylvania,
W81-02821 5C

SCHERFIG, J.
Water Quality of a Reservoir Used for Reclaimed Water Storage,
W81-02712 5G

SCHICHT, R. J.
Bank Erosion of the Illinois River,
W81-02791 2J

SCHMIDT, K. D.
Brine Pollution at Fresno - Twenty-Six Years Later,
W81-02843 5B

SCHMUGGE, T. J.
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report,
W81-02782 2G

SCHNEIDER, J. J.
Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

SEIDLER, R. J.
Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies,
W81-02848 5A

SEKI, H.
Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

SELYUTIN, V. V.
A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

SHANNON, J. D.
Survey and Control of Synthetic Organics in Texas Water Supplies,
W81-02719 5A

SHARMA, A. P.
Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

SHARMA, P. C.
Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

SHAY, D. E.
Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

SHEIKH, K. H.
Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

SHENG, Y. P.
A Two-Mode Free-Surface Numerical Model for the Three-Dimensional Time-Dependent Currents in Large Lakes,
W81-02778 2H

SHORTREED, K. S.
Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

SILKA, L. R.
Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

SILVERBERG, N.
Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum,
W81-02822 2L

SIMONS, R. K.
Dissolved Oxygen Impact from Urban Storm Runoff,
W81-02757 5C

SIMPSON, J. H.
Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

SINGH, K. P.
Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

Flood Frequency Modeling and Outliers,
W81-02803 2E

SIZEMORE, R. K.
Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

SKIDMORE, E. L.
Application of Wind Energy to Great Plains Irrigation Pumping,
W81-02781 8C

SLACK, D. C.
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

SMITH, L. M.
Chromatographic Enrichment of Acidic Compounds From Organic Solvents Using Alkali Metal Silicates,
W81-02829 5A

SMITTLE, D. A.
Irrigation of Crops in the Southeastern United States, Principles and Practice,
W81-02780 3F

SOLLINS, P.
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

SONZOGNI, W. C.
Modeling the Great Lakes - A History of Achievement,
W81-02731 7A

SPACIE, A.
Temperature-Controlled Recirculating System for Hatching Catostomid Larvae,
W81-02728 8I

SPALDING, B. P.
Chemical Treatments of Soil to Decrease Radiostrontium Leachability,
W81-02826 5G

SPISER, D. E.
Selected Water-Level Records for Oklahoma, 1979-80,
W81-02683 2F

SPYRIDAKIS, D. E.
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

SRIDHAR, M. K. C.
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

STALLING, D. L.
Chromatographic Enrichment of Acidic Compounds From Organic Solvents Using Alkali Metal Silicates,
W81-02829 5A

STANSBERY, D. H.
Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

STEIN, R. B.
Groundwater Contamination Potential at 21 Industrial Waste-Water Impoundments in Ohio,
W81-02841 5B

STERN, D. H.
Effects of Fly Ash Heavy Metals on Daphnia Magna,
W81-02715 5B

STERN, M. S.
Effects of Fly Ash Heavy Metals on Daphnia Magna,
W81-02715 5B

STOCKNER, J. G.
Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

STUKENBERG, J.
Industrial Wastewater Vs. the POTW,
W81-02884 5D

SUN, Y. A.
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

SUNDBY, B.
Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum,
W81-02822 2L

SURKOV, F. A.
Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems,
W81-02743 6A

A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal,
W81-02734 5C

SWAIN, W. R.
Transport of Mining Waste in Lake Superior,
W81-02739 5B

SWARTZ, R. G.
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

SWEENEY, D.
Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

Phase II Report - Preliminary Investigation of Small-Scale Hydropower Potential at Five Sites in Illinois,
W81-02790 6B

SWEET, T. R.
Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

SYDOR, M.
A Multi-Layered Nested Grid Model of Lake Superior,
W81-02741 2H

Transport of Mining Waste in Lake Superior,
W81-02739 5B

TANJI, K. K.
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

TERRY, R. V.
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

THOM, R. M.
Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

TIEDEMANN, R. B.
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

TIMMS, B. V.
The Macrobenthos of Lakes Rotoroa and Rotoiti, South Island, New Zeland, With Special Reference to the Influence of Allochthonous Organic Detritus,
W81-02880 2H

TOBBEN, P.
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

TOMLINSON, R. D.
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

TOPLISS, B. J.
Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

TREWEEK, G. P.
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

TRUSSELL, R. R.
Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

TSYTSARIN, G. V.
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

TUFFEY, T. J.
The Nitrogen Cycle in the Delaware River,
W81-02727 5C

TUNDISI, J. G.
Primary Production of Phytoplankton and Environmental Characteristics of a Shallow Quaternary Lake at Eastern Brazil,
W81-02878 5C

TURKELTAUB, R.
Urban Runoff Receiving Water Impacts: Program Overview and Research Needs,
W81-02748 5C

VAN DER KOOIJ, D.
Utilization of Low Concentrations of Starch by a Flavobacterium Species Isolated From Tap Water,
W81-02851 5A

VINES, R. G.
Analyses of South African Rainfall,
W81-02873 2B

VISOCKY, A. P.
Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

VLADIMIRSKIY, B. M.
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

VOSS, R. H.
Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents,
W81-02875 5A

WALLER, B. G.
Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

WALSH, J. J.
Waste Impoundment Assessment in the State of Indiana,
W81-02842 5B

WANGSNESS, D. J.
Behavioral and Catastrophic Drift of Invertebrates in Two Streams in Northeastern Wyoming,
W81-02702 2E

WANIELISTA, M. P.
Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

WARD, A. K.
Interactions of Light and Nitrogen Source Among Planktonic Blue-Green Algae,
W81-02807 5C

WARING, R. H.
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

WASHINGTON, J. N.
Coal-Liquefaction Products, Shale Oil, and Petroleum. Acute Toxicity to Freshwater Algae,
W81-02854 5C

WEHRMANN, H. A.
Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

WEINER, R. M.
Rate of Occurrence of False-Positive Results From Total Coliform· Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

WELCH, S.
Public Attitudes of Nebraskans Toward Water Policy,
W81-02725 6E

WELSH, R. P. H.
The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

WELTER, G. J.
The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

WELTON, J. S.
Dynamics of Sediment and Organic Detritus in a Small Chalk Stream,
W81-02879 2J

WENDT, R. C.
Conservation Tillage: Best Management Practice for Nonpoint Runoff,
W81-02818 4D

WESCHE, T. A.
The WRRI Trout Cover Rating Method: Development and Application,
W81-02717 8I

WESTGREN, R. E.
Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

WETZEL, R. G.
Interactions of Light and Nitrogen Source Among Planktonic Blue-Green Algae,
W81-02807 5C

WEY, S. S.
Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils,
W81-02866 5A

WHEATSTONE, K. C.
Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation,
W81-02811 5A

WHITNEY, F.
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

WIDDOWS, J.
Measurement of Physiological Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

WILCOX, D. E.
Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

WILLIAMS, D. D.
Temporal Patterns in Recolonization of Stream Benthos,
W81-02883 5C

WILLIAMS, H. N.
Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

WILLIAMS, P. J. LE B.
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

WILSON, J. B.
The Effect of a Fluoride Effluent on Marine Organisms,
W81-02863 5C

WONG, A.
Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents,
W81-02875 5A

WONG, C. S.
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

WONG, M. H.
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa,
W81-02861 5D

WOOD, D. J.
Algorithms for Pipe Network Analysis and Their Reliability,
W81-02658 8C

WRIGHT, G. P.
The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

WYCOFF, R. L.
A Water Quality Planning Methodology for Urban Areas,
W81-02771 6B

WYTZES, J.
Development of a Groundwater Model for the Henry's Fork and Rigby Fan Areas, Upper Snake River Basin, Idaho,
W81-02804 6A

YAKSICH, S. M.
The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

YANG, P-D.
Survey and Control of Synthetic Organics in Texas Water Supplies,
W81-02719 5A

YOUSEF, Y. A.
Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

ZACK, A. L.
Geochemistry of Fluoride in the Black Creek Aquifer System of Horry and Georgetown Counties, South Carolina--and its Physiological Implications,
W81-02677 5G

ZIMMERMAN, N. J.
Waste Water Spray Transport in Land Application,
W81-02722 3F

ZOLLER, W. H.
Atmospheric Emissions of Elements on Particles From the Parkway Sewage-Sludge Incinerator,
W81-02855 5E

ORGANIZATIONAL INDEX

AALBORG UNIV., DENMARK. DEPT. OF ENVIRONMENTAL ENGINEERING.
The Impact of Combined Sewer Overflows on the Dissolved Oxygen Concentration of a Small Stream,
W81-02758 5C

ABCOR INC., WILMINGTON, MA. WALDEN DIV.
Laboratory and Field Evaluation of NS-100 Reverse Osmosis Membrane,
W81-02777 5D

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, AVONDALE, PA. STROUD WATER RESEARCH CENTER.
Fungal Pathogen of Cladophora Glomerata (Chlorophyta),
W81-02846 5G

ACADEMY OF NATURAL SCIENCES, PHILADELPHIA, PA. DIV. OF LIMNOLOGY AND ECOLOGY.
Acid Lakes From Natural and Anthropogenic Causes,
W81-02870 5B

AKADEMIYA NAUK SSSR, LENINGRAD. INST. EVOLYUTSIONNOI FIZIOLOGII I BIOKHIMII.
A Segmented Model of the Dynamics of the Ecosystem of Lake Baikal Considering Three-Dimensional Circulation of the Water,
W81-02747 2H

AKADEMIYA NAUK URSR, KIEV.
Self-Organization of Three-Dimensional Models of Water Pollution,
W81-02745 5B

ALABAMA UNIV., UNIVERSITY. DEPT. OF BIOLOGY.
Interactions of Light and Nitrogen Source Among Planktonic Blue-Green Algae,
W81-02807 5C

ALBERTA UNIV., EDMONTON. DEPT. OF BOTANY.
Phosphorus, Chlorophyll, and Eutrophic Lakes,
W81-02886 5C

AMERICAN UNIV., WASHINGTON, DC. DEPT. OF BIOLOGY.
The Distribution, Transport and Cycling of Dissolved and Particulate Organic Carbon in the Potomac and Anacostia Rivers in the Greater Washington Area,
W81-02656 5B

ARIZONA UNIV., TUCSON. COLL. OF AGRICULTURE.
The Long Run Profitability of Western Irrigated Agriculture: An In-Depth Analysis,
W81-02655 6C

BAYLOR COLL. OF MEDICINE, HOUSTON, TX. DEPT. OF VIROLOGY AND EPIDEMIOLOGY.
Simple Method for Concentration of Bacteria From Large Volumes of Tap Water,
W81-02853 5A

BISWAS AND ASSOCIATES, OXFORD (ENGLAND).
Non-Radiological Environmental Implications of Nuclear Energy,
W81-02895 5C

BLACK AND VEATCH KANSAS CITY, MO.
Industrial Wastewater Vs. the POTW,
W81-02884 5D

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF OCEANOGRAPHY.
The Effect of Glucose on the Productivity of Seawater: An Experimental Approach Using Controlled Aquatic Ecosystems,
W81-02825 5C

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SACRAMENTO.
Waste Discharge Requirements for Nonsewerable Waste Disposal to Land,
W81-02798 5C

Kelp Beds at Saunders Reef, Mendocino County.
W81-02799 5C

San Diego Marine Life Refuge, San Diego County.
W81-02800 5C

Julia Pfeiffer Burns Underwater Park, Monterey County.
W81-02801 5C

CALIFORNIA UNIV., DAVIS. CALIFORNIA WATER RESOURCES CENTER.
Mechanisms of Transport of Copper, Cadmium and Chromium in Soils,
W81-02653 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF LAND, AIR AND WATER RESOURCES.
Chemical and Mineralogical Composition and Behavior of the Mancos Shale as a Diffuse Source of Salts in the Upper Colorado River Basin,
W81-02711 5B

CALIFORNIA UNIV., IRVINE. DIV. OF ENVIRONMENTAL ANALYSIS.
Scanning Electron Microscope Evidence for Bacterial Colonization of a Drinking-Water Distribution System,
W81-02812 5A

CALIFORNIA UNIV., IRVINE. SCHOOL OF ENGINEERING.
Water Quality of a Reservoir Used for Reclaimed Water Storage,
W81-02712 5G

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF MECHANICAL AND ENVIRONMENTAL ENGINEERING.
The Transport of Contaminants in Lake Erie,
W81-02744 5B

CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND). DEPT. OF ZOOLOGY.
The Macrobenthos of Lakes Rotoroa and Rotoiti, South Island, New Zeland, With Special Reference to the Influence of Allochthonous Organic Detritus,
W81-02880 2H

CASE WESTERN RESERVE UNIV., CLEVELAND, OH.
A Two-Mode Free-Surface Numerical Model for the Three-Dimensional Time-Dependent Currents in Large Lakes,
W81-02778 2H

CH2M/HILL, RESTON, VA.
A Water Quality Planning Methodology for Urban Areas,
W81-02771 6B

CHINESE UNIVERSITY OF HONG KONG, SHATIN. DEPT. OF BIOLOGY.
The Comparison of Soy-Bean Wastes, Used Tea Leaves and Sewage Sludge for Growing Chlorella Pyrenoidosa,
W81-02861 5D

CINCINNATI, OH. MUNICIPAL ENVIRONMENTAL RESEARCH LAB.
GC/MS Methodology for Measuring Priority Organics in Municipal Waste Water Treatment,
W81-02784 5A

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, NH.
Overland Flow: Removal of Toxic Volatile Organics,
W81-02779 5D

COLORADO STATE UNIV., FORT COLLINS.
An Approach for Assessing the Water Quality Significance of Chemical Contaminants in Urban Lakes,
W81-02749 5C

COLUMBIA NATIONAL FISHERIES RESEARCH LAB., MO.
Chromatographic Enrichment of Acidic Compounds From Organic Solvents Using Alkali Metal Silicates,
W81-02829 5A

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, SOUTH MELBOURNE (AUSTRALIA). DIV. OF CHEMICAL TECHNOLOGY.
Analyses of South African Rainfall,
W81-02873 2B

CORNELL UNIV., ITHACA, NY.
Mechanisms by Which Acid Precipitation Produces Embryonic Death in Aquatic Vertebrates,
W81-02716 5C

CORNELL UNIV., ITHACA, NY. DEPT. OF AGRONOMY.
Biodegradation of Chemicals of Environmental Concern,
W81-02871 5B

CORNELL UNIV., ITHACA, NY. LAB. OF SOIL MICROBIOLOGY.
Evidence for Cometabolism in Sewage,
W81-02849 5B

CORPS OF ENGINEERS, BUFFALO, NY. BUFFALO DISTRICT.
The Response of Great Lakes Estuaries to Stormwater Runoff,
W81-02760 5C

DATAGRAPHICS, INC., PITTSBURGH, PA.
The Feasibility of a Regional Industrial Waste Water Treatment Facility,
W81-02786 5D

DEPARTMENT OF FISHERIES AND OCEANS, WINNIPEG (MANITOBA). FRESHWATER INST.
The Inadequacy of Existing Chlorophyll-a/Phosphorus Concentration Correlations for Assessing Remedial Measures for Hypertrophic Lakes,
W81-02856 5C

DUKE UNIV., DURHAM, NC. DEPT. OF CIVIL ENGINEERING.
Continuous Receiving Water Quality Modeling for Urban Stormwater Management,
W81-02767 5C

EASTERN TENNESSEE STATE UNIV., JOHNSON CITY. DEPT. OF ENVIRONMENTAL HEALTH.
Evaluation of the Impact Imposed upon Surface Water Sources by Implementation of the Federal Water Conservation and Reuse Policy in a River Basin with a Water Surplus,
W81-02654 3C

ECOLSCIENCES, INC., MILWAUKEE, WI.
Analysis of Receiving Stream Impacts on the Milwaukee River,
W81-02755 5C

ECONOMICS AND STATISTICS SERVICE, WASHINGTON, DC. CROP REPORTING BOARD.
Aquaculture: Catfish and Trout, Inventory and Sales, 1980.
W81-02776 8I

ENVIRONMENTAL PROTECTION AGENCY, COLUMBUS, OH GROUNDWATER DIV.
Groundwater Contamination Potential at 21 Industrial Waste-Water Impoundments in Ohio,
W81-02841 5B

ENVIRONMENTAL RESEARCH LAB.-DULUTH, GROSSE ILE, MI. LARGE LAKES RESEARCH STATION.
Data Management Requirements for Great Lakes Water Quality Modeling,
W81-02732 7C

Optimal Sampling for Long Term Trends in Lake Huron,
W81-02733 7B

Results of a Joint USA/USSR Hydrodynamic Modeling Project for Lake Baikal,
W81-02737 2H

A Spatially-Segmented Multi-Class Phytoplankton Model for Saginaw Bay, Lake Huron,
W81-02746 5C

ENVIRONMENTAL RESEARCH LAB., DULUTH, MN.
Transport of Mining Waste in Lake Superior,
W81-02739 5B

ENVIRONMENTAL RESEARCH LAB., NARRAGANSETT, RI.
Measurement of Physiolcgical Condition of Mussels Transplanted Along a Pollution Gradient in Narragansett Bay,
W81-02819 5C

FILMTEC CORP., MINNEAPOLIS, MN.
Advanced Pretreatment Process for Waste Water Reuse Using Reverse Osmosis,
W81-02710 5D

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF OCEANOGRAPHY.
The Effect of Urban Stormwater Runoff on the Water Quality of Lake Jackson, Florida,
W81-02750 5C

FLORIDA UNIV., GAINESVILLE.
Nationwide Assessment of Urban Stormwater Pollution Impacts on Receiving Water Bodies,
W81-02765 5C

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.
Recovery of Coliphages From Waste Water Effluents and Polluted Lake Water by the Magnetite-Organic Flocculation Method,
W81-02852 5A

FRESHWATER BIOLOGICAL ASSOCIATION, DORSET (ENGLAND). RIVER LAB.
Dynamics of Sediment and Organic Detritus in a Small Chalk Stream,
W81-02879 2J

FRESHWATER FISHERIES LAB., PITLOCHRY (SCOTLAND).
Organochlorine Compounds in Mussels From Scottish Coastal Waters,
W81-02858 5A

GEOLOGICAL SURVEY, ALBANY, NY. WATER RESOURCES DIV.
Surficial Geology of Orwell Quadrangle, Oswego County, New York,
W81-02662 7C

Surficial Geology of Part of Boylston Center Quadrangle, Oswego County, New York,
W81-02665 7C

Surficial Geology of Part of Sandy Creek Quadrangle, Oswego County, New York,
W81-02666 7C

Surficial Geology of Part of Worth Center Quadrangle, Oswego County, New York,
W81-02667 7C

Surficial Geology of Oswego West Quadrangle, Oswego County, New York,
W81-02668 7C

Permeability of Covers Over Low-Level Radioactive-Waste Burial Trenches, West Valley, Cattaraugus County, New York,
W81-02692 5E

GEOLOGICAL SURVEY, ALBUQUERQUE, NM. WATER RESOURCES DIV.
Hydrologic Maps and Data for Santa Fe County, New Mexico,
W81-02703 7C

GEOLOGICAL SURVEY, ANCHORAGE, AK. WATER RESOURCES DIV.
Geohydrology of the Delta-Clearwater Area, Alaska,
W81-02688 2F

GEOLOGICAL SURVEY, AUSTIN, TX. WATER RESOURCES DIV.
Effects of the Rate of Releases From Sam Rayburn Reservoir on the Aeration Capacity of the Angelina River, Eastern Texas,
W81-02686 4A

GEOLOGICAL SURVEY, BATON ROUGE, LA. WATER RESOURCES DIV.
Water Resources Data for Louisiana, Water Year 1980--Volume 2. Southern Louisiana.
W81-02674 7C

GEOLOGICAL SURVEY, BOISE, ID. WATER RESOURCES DIV.
Using Channel Geometry to Estimate Flood Flows at Ungaged Sites in Idaho,
W81-02679 6A

GEOLOGICAL SURVEY, CARSON CITY, NV. WATER RESOURCES DIV.
Water Resources Data for Nevada, Water Year 1979.
W81-02698 7C

GEOLOGICAL SURVEY, CHEYENNE, WY. WATER RESOURCES DIV.
Behavioral and Catastrophic Drift of Invertebrates in Two Streams in Northeastern Wyoming,
W81-02702 2E

GEOLOGICAL SURVEY, COLUMBIA, SC. WATER RESOURCES DIV.
Geochemistry of Fluoride in the Black Creek Aquifer System of Horry and Georgetown Counties, South Carolina--and its Physiological Implications,
W81-02677 5G

GEOLOGICAL SURVEY, DENVER, CO. WATER RESOURCES DIV.
Evaluating Methods for Determining Water Use in the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming; 1979,
W81-02691 4B

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part I. River Hydraulics and Sediment Transport, 1979,
W81-02704 2J

Field Data Describing the Movement and Storage of Sediment in the East Fork River, Wyoming. Part II. Bed Elevations, 1979,
W81-02705 2J

GEOLOGICAL SURVEY, HARRISBURG, PA. WATER RESOURCES DIV.
Ground-Water Quality and Data on Wells and Springs in Pennsylvania, Volume I--Ohio and St. Lawrence River Basins,
W81-02675 7C

GEOLOGICAL SURVEY, HELENA, MT. WATER RESOURCES DIV.
Measurements of Discharge, Gain or Loss in Flow, and Chemical Quality of the Poplar and Redwater Rivers, Northeastern Montana, October 24-25, 1979,
W81-02682 7C

GEOLOGICAL SURVEY, HOUSTON, TX. WATER RESOURCES DIV.
Chemical and Physical Characteristics of Water in Estuaries of Texas, October 1974-September 1975,
W81-02684 2L

GEOLOGICAL SURVEY, LAKEWOOD, CO. WATER RESOURCES DIV.
Streamflow Statistical Summaries for Colorado Streams Through September 30, 1975, Volume 2: Colorado River Basin Above Gunnison River,
W81-02676 7C

GEOLOGICAL SURVEY, LAWRENCE, KS. WATER RESOURCES DIV.
Preliminary Analysis of Regional-Precipitation Periodicity,
W81-02687 2B

Relationships Between Basic Soils-Engineering Equations and Basic Ground-Water Flow Equations,
W81-02708 2F

GEOLOGICAL SURVEY, LOUISVILLE, KY. WATER RESOURCES DIV.
Selected Chemical Quality Characteristics in Streams of Kentucky, 1970-75.
W81-02680 2K

GEOLOGICAL SURVEY, MENLO PARK, CA. WATER RESOURCES DIV.
Water Resources Data for California, Water Year 1979--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
W81-02672 7C

Water Resources Data for California, Water Year 1979--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W81-02673 7C

A Water-Quality Monitoring Network for Vallecitos Valley, Alameda County, California,
W81-02685 5B

Seawater Intrusion and Potential Yield of Aquifers in the Soquel-Aptos Area, Santa Cruz County, California,
W81-02690 5B

Appraisal of Ground-Water Resouces in the San Antonio Creek Valley, Santa Barbara County, California,
W81-02700 6D

GEOLOGICAL SURVEY, OKLAHOMA CITY, OK. WATER RESOURCES DIV.
Selected Water-Level Records for Oklahoma, 1979-80,
W81-02683 2F

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.
Directory of Assistance Centers of the National Water Data Exchange (NAWDEX),
W81-02681 10D

Computer Routines for Probability Distributions, Random Numbers, and Related Functions,
W81-02693 6A

GEOLOGICAL SURVEY, RICHMOND, VA. WATER RESOURCES DIV.
Groundwater Hydrology of James City County, Virginia,
W81-02695 2F

GEOLOGICAL SURVEY, ROLLA, MO. WATER RESOURCES DIV.
Effects of the Proposed Prosperity Reservoir on Ground Water and Water Quality in Lower Center Creek Basin, Missouri,
W81-02678 5B

Evaluation of Peak-Flow Data Network of Small Streams in Missouri,
W81-02689 2E

GEOLOGICAL SURVEY, SALT LAKE CITY, UT. WATER RESOURCES DIV.
Hydrologic and Climatologic Data, Southeastern Uinta Basin, Utah, and Colorado, Water Year 1978,
W81-02694 7C

GEOLOGICAL SURVEY, TACOMA, WA. WATER RESOURCES DIV.
Effects of Artificial-Recharge Experiments at Ship Creek Alluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska,
W81-02696 4B

GEOLOGICAL SURVEY, TALLAHASSEE, FL. WATER RESOURCES DIV.
Summary of Hydrologic Data for the East Everglades, Dade County, Florida,
W81-02697 7C

Water-Resources Investigations, Collier County, Florida,
W81-02699 5G

GEOLOGICAL SURVEY, TUCSON, AZ. WATER RESOURCES DIV.
Study Plan for the Regional Aquifer-System 'Analysis of Alluvial Basins in South-Central Arizona and Adjacent States,
W81-02701 6A

GEOLOGICAL SURVEY, UNIVERSITY, AL. WATER RESOURCES DIV.
Water Resources Data for Alabama, Water Year 1979--Volume 1. Apalachicola, Choctawatchee, Blackwater, Escambia, Perdido, and Alabama River Basins.
W81-02706 7C

Water Resources Data for Alabama, Water Year 1979--Volume 2. Tombigbee, Mobile, Dog, Pascagoula, and Tennessee River Basins.
W81-02707 7C

GEORGIA INST. OF TECH., ATLANTA. COLL. OF ARCHITECTURE.
Estimating Flood Damages in the State of Georgia,
W81-02720 6F

GEORGIA UNIV., ATHENS. DEPT. OF GEOLOGY.
Affinity Tests for the Detection of Community Alteration in Plankton: Evaluation With a Distributional Computer Model,
W81-02860 5C

GIDROKHIMICHESKII INST., ROSTOV-NA-DONU (USSR).
Basic Trends in the Study of Hydrochemical Fields and the Structure of Their Space-Time Heterogeneities,
W81-02730 7A

The Structure of Hydrochemical Fields and Short-Term Prediction,
W81-02738 2A

Principle of Organization of an Automated Information System,
W81-02740 7C

GIESSEN UNIV. (GERMANY, F.R.). INST. FUER PFLANZENOEKOLOGIE.
Some Ecological Observations on Environmental Parameters, Planktonic Seasonal Succession and Biomass in Rio Cruces (Prov. Valdivia), South Chile,
W81-02876 5C

GOSUDARSTVENNYI GIDROLOGICHESKII INST., LENINGRAD (USSR).
Simulation of the Distribution of Polluted Water in Reservoirs From Concentrated Emissions,
W81-02736 5B

GREAT LAKES BASIN COMMISSION, ANN ARBOR, MI.
Modeling the Great Lakes - A History of Achievement,
W81-02731 7A

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Bayes-Markov Analysis for Rain-Catchment Cisterns,
W81-02657 4A

HAYS AND LINDSEY, INC., AUSTIN, TX.
Water Quality and Urban Runoff in Selected Canal Communities Along the Texas Coast,
W81-02761 5C

HOUDAILLE INDUSTRIES, INC., FORT LAUDERDALE, FL.(ASSIGNEE).
Multi Stage Flocculation Treatment System,
W81-02805 5D

HOUSTON UNIV., TX.
Incidence of Plasmids in Marine Vibrio SPP. Isolated From an Oil Field in the Northwestern Gulf of Mexico,
W81-02813 5A

IBADAN UNIV. (NIGERIA). DEPT. OF PREVENTIVE MEDICINE AND SOCIAL MEDICINE.
Health Hazards and Pollution From Open Drains in a Nigerian City,
W81-02900 5B

IDAHO UNIV., MOSCOW. WATER AND ENERGY RESOURCES RESEARCH INST.
Development of a Groundwater Model for the Henry's Fork and Rigby Fan Areas, Upper Snake River Basin, Idaho,
W81-02804 6A

ILLINOIS NATURAL HISTORY SURVEY, URBANA.
Aquaculture: Opportunities for an Expanded Industry in Illinois,
W81-02797 8I

ILLINOIS STATE WATER SURVEY, URBANA.
Bank Erosion of the Illinois River,
W81-02791 2J

Coliforms and Fecal Streptococcus in the Illinois River at Peoria, 1971-1976,
W81-02792 5B

Physical, Chemical, and Biological Characteristics of Lake Ellyn Sediments.
W81-02793 2H

Assessment of Public Groundwater Supplies in Illinois,
W81-02794 4B

Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985-2010,
W81-02795 4B

Adequacy and Economics of Water Supply in Northeastern Illinois, 1985-2010,
W81-02796 6A

Flood Frequency Modeling and Outliers,
W81-02803 2E

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. INST. FOR ENVIRONMENTAL STUDIES.
Development of Methods for the Detection of Trace Amounts of Selected Carcinogenic and Mutagenic Amines in Water,
W81-02721 5A

INSTITUT DE GEOLOGIE DU BASSIN D'AQUITAINE, TALENCE (FRANCE).
Comparison of the Different Methods for the Recovery of Suspended Matter From Estuarine Waters: Deposition, Filtration and Centrifugation: Consequences for the Determination of Some Heavy Metals,
W81-02888 5A

INSTITUT NATIONALE DE LA RECHERCHE SCIENTIFIQUE SAINTE-FOY (QUEBEC).
Environmental Impact of Kraft Plant Effluents on Salmo Salar Ouananiche Analyzed by a New Method, the Coherence Graph. (Evaluation des Impacts Environnementaux Dus Au Rejets D'Une Usine de Pate Kraft Sur Le Salmo Salar Ouananiche A L'Aide D'Une Nouvelle Methode: Le Graphe de Coherence),
W81-02867 5C

ISRAEL OCEANOGRAPHIC AND LIMNOLOGICAL RESEARCH LTD., HAIFA.
Heavy Metals in Donax Trunculus L. (Bivalvia) in Haifa Bay, Mediterranean (Israel),
W81-02894 5A

KANSAS AGRICULTURAL EXPERIMENT STATION, MANHATTAN. EVAPOTRANSPIRATION LAB.
The Effect of Beef Feedlot Runoff on the Nitrate-Nitrogen Content of a Shallow Aquifer,
W81-02828 5B

KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.
Algorithms for Pipe Network Analysis and Their Reliability,
W81-02658 8C

KEURINGSINSTITUUT VOOR WATERLEIDINGARTIKELEN, RIJSWIJK (NETHERLANDS).
Utilization of Low Concentrations of Starch by a Flavobacterium Species Isolated From Tap Water,
W81-02851 5A

KING ALFRED'S COLL., WINCHESTER (ENGLAND).
The Politics of Water Pollution Control: A Case Study of the Formation of the Canada Water Act, Part I: Comprehensive Water Resource Management: Part II: Nutrient Control,
W81-02836 6E

KUMAUN UNIV., NAINI TAL (INDIA). DEPT. OF ZOOLOGY.
Evidence for the Increased Eutrophication of Lake Nainital as a Result of Human Interference,
W81-02890 5C

KYOTO UNIV. (JAPAN). DEPT. OF FISHERIES.
Relationship Between Heterotrophic Bacteria and Phytoplankton in Lake Mergozzo and Lake Biwa,
W81-02881 2H

LAVAL UNIV., QUEBEC. CENTRE D'ETUDES NORDIQUES.
Estuarine Fish Communities of the Eastern James-Hudson Bay Coast,
W81-02834 2L

LIVERPOOL POLYTECHNIC (ENGLAND). DEPT. OF BIOLOGY.
The Distribution of the Polychaete Capitella Capitata (Fabricius) in Dock Sediments,
W81-02887 5C

LOUISIANA STATE UNIV., BATON ROUGE. LAB. FOR WETLAND SOILS AND SEDIMENTS.
Nitrogen and Phosphorus Distribution and Utilization by Spartina Alterniflora in a Louisiana Gulf Coast Marsh,
W81-02840 2L

LUND UNIV. (SWEDEN), DEPT. OF RADIATION PHYSICS.
Distribution of Activation Products from Barseback Nuclear Power Plant (Sweden) in the Marine Environment. Temporal and Spatial Variations as Established by Seaweed,
W81-02815 5B

MALAYA UNIV., KUALA LUMPUR (MALAYSIA).
Use of Synthetic Detergents in Malaysia,
W81-02896 5C

MANHATTAN COLL., BRONX, NY.
Impacts of Intermittent Urban Discharges on Receiving Waters,
W81-02759 5C

MANHATTAN COLL., BRONX, NY. ENVIRONMENTAL ENGINEERING AND SCIENCE PROGRAM.
Species Dependent Mass Transport and Chemical Equilibria: Application to Chesapeake Bay Sediments,
W81-02735 2K

Statistics of Receiving Water Response to Runoff,
W81-02766 5C

MARINE ENVIRONMENTAL SCIENCES CONSORTIUM, DAUPHIN ISLAND, AL.
Impacts of Stormwater Runoff on a Florida Lake Ecosystem: Effects on Water Quality and Biota,
W81-02752 5C

MARYLAND UNIV., BALTIMORE. DEPT. OF MICROBIOLOGY.
Incidence of Marine Bdellovibrios Lytic Against Vibrio Parahaemolyticus in Chesapeake Bay,
W81-02845 5A

MARYLAND UNIV., COLLEGE PARK. DEPT. OF CHEMISTRY.
Atmospheric Emissions of Elements on Particles From the Parkway Sewage-Sludge Incinerator,
W81-02855 5E

MARYLAND UNIV., COLLEGE PARK. DEPT. OF MICROBIOLOGY.
Rate of Occurrence of False-Positive Results From Total Coliform Most-Probable-Number Analysis of Shellfish and Estuaries,
W81-02847 2L

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF FISHERIES AND WILDLIFE.
A Comparison of Rain-Related Phosphorus and Nitrogen Loading from Urban, Wetland, and Agricultural Sources,
W81-02751 5C

MICHIGAN UNIV., ANN ARBOR. SCHOOL OF NATURAL RESOURCES.
A Review of Some Methods and Parameters Used in Assessing Effects of Water Intakes on Fish Populations,
W81-02742 5C

MINISTRY OF WORKS AND HOUSING, IBADAN (NIGERIA).
The Effect of pH on the Coagulation and Purification of Wastewater,
W81-02832 5D

MINNESOTA UNIV., DULUTH. DEPT. OF PHYSICS.
A Multi-Layered Nested Grid Model of Lake Superior,
W81-02741 2H

MINNESOTA UNIV., MINNEAPOLIS.
Use of Crop Canopy-Air Temperature Difference for Irrigation Scheduling,
W81-02724 3F

MISSOURI UNIV.-COLUMBIA. DEPT. OF CHEMISTRY.
Interchange of Pollutants Between Groundwater and Mineral Strata as Applied to Waste Chemical Dumps and in Situ Coal Gasification Sites,
W81-02714 5B

MISSOURI UNIV.-KANSAS CITY. DEPT. OF BIOLOGY.
Effects of Fly Ash Heavy Metals on Daphnia Magna,
W81-02715 5B

MISSOURI UNIV.-ROLLA. DEPT. OF CIVIL ENGINEERING.
Use of Calcium Stripping Column to Achieve Energy Conservation and Residue Reuse in Phosphate Precipitation by Lime,
W81-02713 5D

MONTANA COOPERATIVE FISHERY RESEARCH UNIT, BOZEMAN.
Environmental Effects of Western Coal Surface Mining, Part VI - Smallmouth Bass and Largemouth Bass in the Tongue River Reservoir, Montana, 1975-76,
W81-02775 5C

MONTANA STATE UNIV., BOZEMAN. DEPT. OF CIVIL ENGINEERING.
Development of a Streamflow Forecasting Procedure for Intermountain Basins,
W81-02726 6A

MONTGOMERY (JAMES M.), INC., PASADENA, CA.
Hoover Dam Advanced Waste Treatment System; Volume I, Pilot Studies Report.
W81-02772 5D

Hoover Dam Advanced Waste Treatment System: Volume II, Pilot Studies Summary Data.
W81-02773 5D

Evaluation of Industrial Cooling Systems Using Reclaimed Municipal Waste water, Application for Potential Users,
W81-02802 3C

MUNICIPAL ENVIRONMENTAL RESEARCH LAB., EDISON, NJ. STORM AND COMBINED SEWER SECTION.
Urban Runoff Receiving Water Impacts: Program Overview and Research Needs,
W81-02748 5C

Potential of Urban Stormwater Impacts Based on Comparative Analysis of Wet and Dry Weather Pollutant Loads,
W81-02768 5C

MUNICIPALITY OF METROPOLITAN SEATTLE-METRO, WA.
The Distribution of Sediments and Particulate Contaminants from Combined Sewer and Storm Drain Overflows i Seattle's Nearshore Waters,
W81-02753 5B

NAGOYA UNIV. (JAPAN). WATER RESEARCH INST.
Molecular Weight Distribution and Characterization of Dissolved Organic Matter From Lake Waters,
W81-02877 2H

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, GREENBELT, MD. GODDARD SPACE FLIGHT CENTER.
Snowpack Monitoring in North America and Eurasia Using Passive Microwave Satellite Data,
W81-02869 7B

NATIONAL INST. OF OCEANOGRAPHY, PANAJI (INDIA).
Hydrocarbon-Utilising Micro-Organisms From Dona Paula Bay, Goa,
W81-02893 5B

NEBRASKA UNIV.-LINCOLN, DEPT. OF POLITICAL SCIENCE.
Public Attitudes of Nebraskans Toward Water Policy,
W81-02725 6E

NORTH CAROLINA DEPT. OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT, RALEIGH. DIV. OF ENVIRONMENTAL MANAGEMENT.
Urban Stormwater Impacts on Receiving Streams in North Carolina,
W81-02756 5C

NORTH CAROLINA UNIV. AT CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Waste Water Spray Transport in Land Application,
W81-02722 3F

NORTH CAROLINA UNIV. AT WILMINGTON. DEPT. OF BIOLOGY.
Vegetative Propagation of Some Saprolegniaceae Under Simulated-Estuarine-Culture Conditions,
W81-02814 2L

O'BRIEN AND GERE ENGINEERS, INC., SYRACUSE, NY.
The Use of Receiving Water Quality Models in Urban Runoff Pollution Abatement: Application to Marginal Benefit - Marginal Cost Analysis,
W81-02769 5C

OAK RIDGE NATIONAL LAB., TN. ENVIRONMENTAL SCIENCE DIV.
Chemical Treatments of Soil to Decrease Radiostrontium Leachability,
W81-02826 5G

OAK RIDGE NATIONAL LAB., TN. ENVIRONMENTAL SCIENCES DIV.
Coal-Liquefaction Products, Shale Oil, and Petroleum. Acute Toxicity to Freshwater Algae,
W81-02854 5C

The Chronic Toxicity to Daphnia Magna of Acridine, a Representative Azaarene Present in Synthetic Fossil Fuel Products and Waste Waters,
W81-02864 5C

OFFICE OF WATER RESEARCH AND TECHNOLOGY, WASHINGTON, DC.
Water Resources Thesaurus, Third Edition.
W81-02718 10C

OHIO STATE UNIV., COLUMBUS.
Determination of Maganese in Naiad Mollusc Shells by Neutron Activation Analysis,
W81-02859 5A

OKLAHOMA STATE UNIV., STILLWATER.
The Effect of Heavy Metals on the Performance of Rotating Biological Contactors (RBC),
W81-02723 5D

OREGON STATE UNIV., CORVALLIS. DEPT. OF FOREST SCIENCE.
Changes in Nitrogen Cycling at an Old-Growth Douglas-Fir Site After Disturbance,
W81-02844 5C

OREGON STATE UNIV., CORVALLIS. DEPT. OF GENERAL SCIENCE.
An Ion-Exchange Technique for Concentrating Ammonia From Small Volumes of Seawater, W81-02823 5A

OREGON STATE UNIV., CORVALLIS. DEPT. OF MICROBIOLOGY.
Enumeration and Characterization of Standard Plate Count Bacteria in Chlorinated and Raw Water Supplies, W81-02848 5A

OREGON STATE UNIV., CORVALLIS. SCHOOL OF FORESTRY.
Sediment and Organic Matter Transport in Oregon Coast Range Streams, W81-02652 5B

ORLEANS UNIV. (FRANCE).
Pollution of Sea Water and Marine Sediments in Coastal Areas, W81-02808 5B

OTAGO UNIV., PORTOBELLO (NEW ZEALAND). MARINE LAB.
The Effect of a Fluoride Effluent on Marine Organisms, W81-02863 5C

OXFORD UNIV. (ENGLAND), DEPT. OF AGRICULTURAL SCIENCE.
The Statistical Distribution of Sewage and Sludge Analyses, W81-02817 5A

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF BOTANY.
Sediment Characteristics of Eleocharis Acicularis (L.) R. S. Sites in Streams and Lakes of Central Pennsylvania, W81-02821 5C

PENNSYLVANIA UNIV., PHILADELPHIA.
The Search for Equity and Efficiency in the Pricing of a Public Service: Urban Water, W81-02831 6C

PRINCETON UNIV., NJ. DEPT. OF GEOLOGICAL AND GEOPHYSICAL SCIENCES.
Relative Degradation Rates of NTA, EDTA and DTPA and Environmental Implications, W81-02868 5B

PULP AND PAPER RESEARCH INST. OF CANADA, POINTE CLAIRE (QUEBEC).
Isolation and Identification of an Ames-Mutagenic Compound Present in Kraft Chlorination Effluents, W81-02875 5A

PURDUE UNIV., LAFAYETTE, IN. DEPT. OF FORESTRY AND NATURAL RESOURCES.
Temperature-Controlled Recirculating System for Hatching Catostomid Larvae, W81-02728 8I

QUEBEC UNIV., RIMOUSKI. DEPT. OF OCEANOGRAPHIC.
Factors Influencing Particulate Matter Geochemistry in the St. Lawrence Estuary Turbidity Maximum, W81-02822 2L

RESOURCES CONSERVATION CO., SEATTLE, WA.
High Recovery Seed Slurry Reverse Osmosis Demonstration for Desalting Waters Saturated in Calcium Sulfate. W81-02659 3A

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Isolation of Dissolved Organic Matter and Copper-Organic Complexes From Estuarine Waters Using Reverse-Phase Liquid Chromatography, W81-02824 5A

ROSTOV-ON-DON STATE UNIV. (USSR). INST. OF MECHANICS AND APPLIED MATHEMATICS.
A Model Approach to Estimating the Effects of Anthropogenic Influences on the Ecosystem of Lake Baikal, W81-02734 5C

Control of the Water Resources of the Azov Sea Using the 'Azov Problem' Family of Simulation Systems, W81-02743 6A

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF ENVIRONMENTAL SCIENCE.
The Nitrogen Cycle in the Delaware River, W81-02727 5C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF SOILS AND CROPS.
Modeling Sewage Sludge Decomposition in Soil: 1. Organic Carbon Transformation, W81-02837 5D

Modeling Sewage Sludge Decomposition in Soil: II. Nitrogen Transformations, W81-02838 5E

SCARBOROUGH COLL., TORONTO (ONTARIO). DIV. OF LIFE SCIENCES.
Temporal Patterns in Recolonization of Stream Benthos, W81-02883 5C

SCIENCE AND EDUCATION ADMINISTRATION, BELTSVILLE, MD. HYDROLOGY LAB.
Aircraft Remote Sensing of Soil Moisture and Hydrologic Parameters, Chickasha, Okla., and Riesel, Tex., 1978 Data Report, W81-02782 2G

SCIENCE AND EDUCATION ADMINISTRATION, MANHATTAN, KS. NORTH CENTRAL REGION.
Application of Wind Energy to Great Plains Irrigation Pumping, W81-02781 8C

SCS ENGINEERS, COVINGTON, KY.
Waste Impoundment Assessment in the State of Indiana, W81-02842 5B

SEA RUN, INC., KENNEBUNKPORT, ME.
A Solar Heated Fish Hatchery Water Recycling System, W81-02709 8I

SEVERN-TRENT WATER AUTHORITY, NOTTINGHAM (ENGLAND). REGIONAL LAB.
Determination of Lead in Drinking Water by Atomic Absorption Spectrophotometry with Electrothermal Atomisation, W81-02811 5A

SOUTHEASTERN FOREST EXPERIMENT STATION, FRANKLIN, NC. COWEETA HYDROLOGIC LAB.
Coweeta Hydrologic Laboratory, 1934-2034: Past, Present and Future, W81-02729 9C

SOUTHERN PIEDMONT CONSERVATION RESEARCH CENTER, WATKINSVILLE, GA.
Irrigation of Crops in the Southeastern United States, Principles and Practice, W81-02780 3F

STAATLICHES INST. FUER SEENFORCHUNG UND FISCHEREIWESEN, LANGENARGEN (GERMANY, F. R.).
Phosphate Removal with Calcium Carbonate Precipitation in the Lake of Constance (Obersee). (Phosphateliminationn Durch Autochthone Calcitfallung Im Bodensee-Obersee), W81-02882 5D

STATE UNIV. OF NEW YORK COLL. AT BUFFALO. DEPT. OF BIOLOGY.
Algal Response to Copper Under Riverine Conditions, W81-02862 5C

STATION MARINE, VILLEFRANCE-SUR-MER (FRANCE). LAB. DE PHYSIQUE ET CHIMIE MARINES.
Phosphorus and Nitrogen in the Mediterranean Sea: Budgets and Potential Fertility. (Le Phosphore et L'Azote En Mer Mediterranee, Bilans et Fertilite Potentielle), W81-02891 5B

STEARNS AND WHELER, CAZENOVIA, NY.
Methodology for Evaluating the Impact and Abatement of Combined Sewer Overflows, A Case Study of Onondaga Lake, New York, W81-02770 5C

SUTRON CORP., ARLINGTON, VA.
Dissolved Oxygen Impact from Urban Storm Runoff, W81-02757 5C

SYRACUSE UNIV., NY.
Surficial Geology of New Haven Quadrangle, Oswego County, New York, W81-02661 7C

Surficial Geology of Part of Lysander Quadrangle, Oswego County, New York, W81-02663 7C

Surficial Geology of Redfield Quadrangle, Oswego County, New York, W81-02664 7C

Surficial Geology of Oswego East Quadrangle, Oswego County, New York, W81-02669 7C

Surficial Geology of Central Square Quadrangle, Oswego County, New York, W81-02670 7C

Surficial Geology of Mexico Quadrangle, Oswego County, New York, W81-02671 7C

TENNESSEE UNIV., KNOXVILLE. DEPT. OF ZOOLOGY.
Thermal Tolerance of the Isopod Lirceus Brachyurus (Crustacea:Isopoda), W81-02810 5C

TENNESSEE VALLEY AUTHORITY, CHATTANOOGA, TN.
Effects of Coal-Ash Leachate on Ground Water Quality, W81-02785 5B

TETRA TECH, INC., LAFAYETTE, CA.
The Ecological Effects of Urban Runoff on Stream Communities, W81-02754 5C

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF CHEMISTRY.
Global Transport of Organic Pollutants: Ambient Concentrations in the Remote Marine Atmosphere, W81-02872 5B

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
Survey and Control of Synthetic Organics in Texas Water Supplies, W81-02719 5A

TEXAS UNIV. AT PORT ARANSAS. MARINE SCIENCE INST.
Persistence of Spilled Oil in a Texas Salt Marsh,
W81-02857 5B

TORONTO UNIV. (ONTARIO). DEPT. OF ZOOLOGY.
Growth Responses of Yellow Perch, Perca Flavescens (Mitchill), to Lake Acidification in the La Cloche Mountain Lakes of Ontario,
W81-02833 5C

TSUKUBA UNIV., IBARAKI (JAPAN). INST. OF BIOLOGICAL SCIENCES.
Turnover Rate of Dissolved Organic Materials in Glacially-Oligotrophic and Dystrophic Lakes in British Columbia, Canada,
W81-02806 2H

TUEBINGEN UNIV. (GERMANY, F.R.). INST. FUER CHEMISCHE PFLANZENPHYSIOLOGIE.
Detection of Lipid Degradation Products in the Water of a Reservoir During a Bloom of Synura Uvella,
W81-02850 5A

UNION CARBIDE CORP., TARRYTOWN, NY.
Caprolactam Recovery from Aqueous Manufacturing Streams,
W81-02783 5D

UNIVERSIDADE FEDERAL DE MINAS GERIS, BELO HORIZONTE (BRAZIL). DEPT. OF GENERAL BIOLOGY.
Primary Production of Phytoplankton and Environmental Characteristics of a Shallow Quaternary Lake at Eastern Brazil,
W81-02878 5C

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO (BRAZIL). DEPT. DE MICROBIOLOGIA GERAL.
Yeasts From Marine and Estuarine Waters with Different Levels of Pollution in the State of Rio De Janeiro, Brazil,
W81-02885 5A

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO (BRAZIL). INST. DE BIOFISICA.
Fate of Chromium in a Tributary of the Iraja River, Rio De Janeiro,
W81-02865 5B

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
Simultaneous Measurements of Transparency and Irradiance in the Coastal Waters of North Wales,
W81-02892 5A

UNIVERSITY OF CENTRAL FLORIDA, ORLANDO. DEPT. OF CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE.
Productivity Responses of Lake Eola to Urban Runoff,
W81-02763 5C

UNIVERSITY OF THE PUNJAB., LAHORE (PAKISTAN). DEPT. OF BOTANY.
Wastewater Effluents From a Tannery: Their Effects on Soil and Vegetation in Pakistan,
W81-02897 3C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. OFFICE OF OCCUPATIONAL HEALTH AND SAFETY.
Elemental Content of Vegetables and Apple Trees Grown on Syracuse Sludge-Amended Soils,
W81-02830 5E

WAPORA, INC., CHICAGO, IL.
Small Scale Hydropower Development in Illinois: An Implementation Manual,
W81-02788 6B

Phase I Report - Inventory of Potential Small-Scale Hydropower Sites in Illinois and Selection of Projects Exhibiting Potential for Development,
W81-02789 6B

Phase II Report - Preliminary Investigation of Small-Scale Hydropower Potential at Five Sites in Illinois,
W81-02790 6B

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES.
The Response of Subtidal Infaunal Communities to a Change in Wastewater Discharge,
W81-02762 5C

Impact of a Combined Sewer Overflow on the Abundance, Distribution, and Community Structure of Subtidal Benthos,
W81-02820 5C

WATER AND POWER RESOURCES SERVICE, DENVER, CO.
Safety Evaluation of Existing Dams, A Manual for the Safety Evaluation of Embankment and Concrete Dams.
W81-02774 8A

WESTFIELD COLL., LONDON (ENGLAND). DEPT. OF BOTANY AND BIOCHEMISTRY.
The Uptake of Lead and Copper by Submerged Aquatic Macrophytes in Two English Lakes,
W81-02827 5B

WISCONSIN UNIV.-MADISON. DEPT. OF SOIL SCIENCE.
Conservation Tillage: Best Management Practice for Nonpoint Runoff,
W81-02818 4D

WISCONSIN UNIV.-MADISON. WATER RESOURCES CENTER.
Hydrochemical and Geophysical Investigation of the Effects of Fly-Ash Disposal on Groundwater,
W81-02651 5C

WISCONSIN UNIV., STEVENS POINT. DEPT. OF PAPER SCIENCE AND ENGINEERING.
Clay is Mosinee's Choice for Reducing TSS Discharge from Clarifier,
W81-02874 5D

WOODWARD CLYDE CONSULTANTS, SAN FRANCISCO, CA.
Water Quality and Biological Degradation in an Urban Creek,
W81-02764 5C

WRIGHT STATE UNIV., DAYTON, OH. DEPT. OF BIOLOGICAL SCIENCES.
Detection of Dimethylnitrosamine and Diethylnitrosamine in Municipal Sewage Sludge Applied to Agricultural Soils,
W81-02866 5A

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
The WRRI Trout Cover Rating Method: Development and Application,
W81-02717 8I

YOKOHAMA NATIONAL UNIV. (JAPAN). INST. OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY.
Studies on the Photochemical Decomposition of Organomercurials--Methylmercury(II) Chloride,
W81-02816 5B

ACCESSION NUMBER INDEX

W81-02651 5C
W81-02652 5B
W81-02653 5B
W81-02654 3C
W81-02655 6C
W81-02656 5B
W81-02657 4A
W81-02658 8C
W81-02659 3A
W81-02660 5D
W81-02661 7C
W81-02662 7C
W81-02663 7C
W81-02664 7C
W81-02665 7C
W81-02666 7C
W81-02667 7C
W81-02668 7C
W81-02669 7C
W81-02670 7C
W81-02671 7C
W81-02672 7C
W81-02673 7C
W81-02674 7C
W81-02675 7C
W81-02676 7C
W81-02677 5G
W81-02678 5B
W81-02679 6A
W81-02680 2K
W81-02681 10D
W81-02682 7C
W81-02683 2F
W81-02684 2L
W81-02685 5B
W81-02686 4A
W81-02687 2B
W81-02688 2F
W81-02689 2E
W81-02690 5B
W81-02691 4B
W81-02692 5E
W81-02693 6A
W81-02694 7C
W81-02695 2F
W81-02696 4B
W81-02697 7C
W81-02698 7C
W81-02699 5G
W81-02700 6D
W81-02701 6A
W81-02702 2E
W81-02703 7C
W81-02704 2J
W81-02705 2J
W81-02706 7C
W81-02707 7C
W81-02708 2F
W81-02709 8I
W81-02710 5D
W81-02711 5B
W81-02712 5G
W81-02713 5D
W81-02714 5B
W81-02715 5B
W81-02716 5C
W81-02717 8I
W81-02718 10C
W81-02719 5A
W81-02720 6F
W81-02721 5A
W81-02722 3F
W81-02723 5D
W81-02724 3F
W81-02725 6E
W81-02726 6A
W81-02727 5C
W81-02728 8I
W81-02729 9C
W81-02730 7A
W81-02731 7A
W81-02732 7C
W81-02733 7B
W81-02734 5C
W81-02735 2K
W81-02736 5B
W81-02737 2H
W81-02738 2A
W81-02739 5B
W81-02740 7C
W81-02741 2H
W81-02742 5C
W81-02743 6A
W81-02744 5B
W81-02745 5B
W81-02746 5C
W81-02747 2H
W81-02748 5C
W81-02749 5C
W81-02750 5C
W81-02751 5C
W81-02752 5C
W81-02753 5B
W81-02754 5C
W81-02755 5C
W81-02756 5C
W81-02757 5C
W81-02758 5C
W81-02759 5C
W81-02760 5C
W81-02761 5C
W81-02762 5C
W81-02763 5C
W81-02764 5C
W81-02765 5C
W81-02766 5C
W81-02767 5C
W81-02768 5C
W81-02769 5C
W81-02770 5C
W81-02771 6B
W81-02772 5D
W81-02773 5D
W81-02774 8A
W81-02775 5C
W81-02776 8I
W81-02777 5D
W81-02778 2H
W81-02779 5D
W81-02780 3F
W81-02781 8C
W81-02782 2G
W81-02783 5D
W81-02784 5A
W81-02785 5B
W81-02786 5D
W81-02787 4A
W81-02788 6B
W81-02789 6B
W81-02790 6B
W81-02791 2J
W81-02792 5B
W81-02793 2H
W81-02794 4B
W81-02795 4B
W81-02796 6A
W81-02797 8I
W81-02798 5C
W81-02799 5C
W81-02800 5C
W81-02801 5C
W81-02802 3C
W81-02803 2E
W81-02804 6A
W81-02805 5D
W81-02806 2H
W81-02807 5C
W81-02808 5B
W81-02809 6E
W81-02810 5C
W81-02811 5A
W81-02812 5A
W81-02813 5A
W81-02814 2L
W81-02815 5B
W81-02816 5B
W81-02817 5A
W81-02818 4D
W81-02819 5C
W81-02820 5C
W81-02821 5C
W81-02822 2L
W81-02823 5A
W81-02824 5A
W81-02825 5C
W81-02826 5G
W81-02827 5B
W81-02828 5B
W81-02829 5A
W81-02830 5E
W81-02831 6C
W81-02832 5D
W81-02833 5C
W81-02834 2L
W81-02835 6G
W81-02836 6E
W81-02837 5D
W81-02838 5E
W81-02839 9C
W81-02840 2L
W81-02841 5B
W81-02842 5B
W81-02843 5B
W81-02844 5C
W81-02845 5A
W81-02846 5G
W81-02847 2L
W81-02848 5A
W81-02849 5B
W81-02850 5A
W81-02851 5A
W81-02852 5A
W81-02853 5A
W81-02854 5C
W81-02855 5E
W81-02856 5C
W81-02857 5B
W81-02858 5A
W81-02859 5A
W81-02860 5C
W81-02861 5D
W81-02862 5C
W81-02863 5C
W81-02864 5C
W81-02865 5B
W81-02866 5A
W81-02867 5C
W81-02868 5B
W81-02869 7B
W81-02870 5B
W81-02871 5B
W81-02872 5B
W81-02873 2B
W81-02874 5D
W81-02875 5A
W81-02876 5C
W81-02877 2H
W81-02878 5C
W81-02879 2J
W81-02880 2H
W81-02881 2H
W81-02882 5D
W81-02883 5C
W81-02884 5D
W81-02885 5A
W81-02886 5C
W81-02887 5C
W81-02888 5A
W81-02889 5D
W81-02890 5C
W81-02891 5B
W81-02892 5A
W81-02893 5B
W81-02894 5A
W81-02895 5C
W81-02896 5C
W81-02897 3C
W81-02898 5F
W81-02899 5D
W81-02900 5B

☆ U.S. GOVERNMENT PRINTING OFFICE : 1981 O - 341-011 (105)

ACCESSION NUMBER INDEX

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSSION NUMBER INDEX

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM 211

Special Fourth-Class Rate Book

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

OFFICIAL BUSINESS

PRINTED MATTER

AN EQUAL OPPORTUNITY EMPLOYER

SWRA
UNIV MICROFILMS INTL X820331
SERIALS ACQUISITIONS
300 N ZEEB RD
ANN ARBOR MI 48106

001

NORTH AMERICAN CONTINENT PRICE SCHEDULE

Customers in Canada, U.S., and Mexico please use this price schedule; other addressees write for Folder PR-360-4.

A01	$3.50	E01	$5.50	I01	$110.00		
A02	5.00	E02	6.50	I02	125.00		
A03	6.50	E03	8.50	I03	210.00		
A04	8.00	E04	10.50	I04	300.00		
A05	9.50	E05	12.50	I05	360.00		
A06	11.00	E06	14.50	I06	420.00		
A07	12.50	E07	16.50	I07	480.00		
A08	14.00	E08	18.50	I08	540.00		
A09	15.50	E09	20.50	I09	600.00		
A10	17.00	E10	22.50	I10	660.00		
A11	18.50	E11	24.50	I11	720.00		
A12	20.00	E12	27.50	I12	780.00		
A13	21.50	E13	30.50	I13	840.00		
A14	23.00	E14	33.50	I14	900.00		
A15	24.50	E15	36.50	I15	960.00		
A16	26.00	E16	39.50	I16	1,020.00		
A17	27.50	E17	42.50	I17	1,080.00		
A18	29.00	E18	45.50	I18	1,140.00		
A19	30.50	E19	50.50	I19	1,200.00		
A20	32.00	E20	60.50	I99	*		
A21	33.50	E99	*				
A22	35.00						
A23	36.50	N01	30.00				
A24	38.00	N02	50.00				
A25	39.50						
A99	*						

*Contact NTIS for price quote

PRICES EFFECTIVE JANUARY 1, 1981